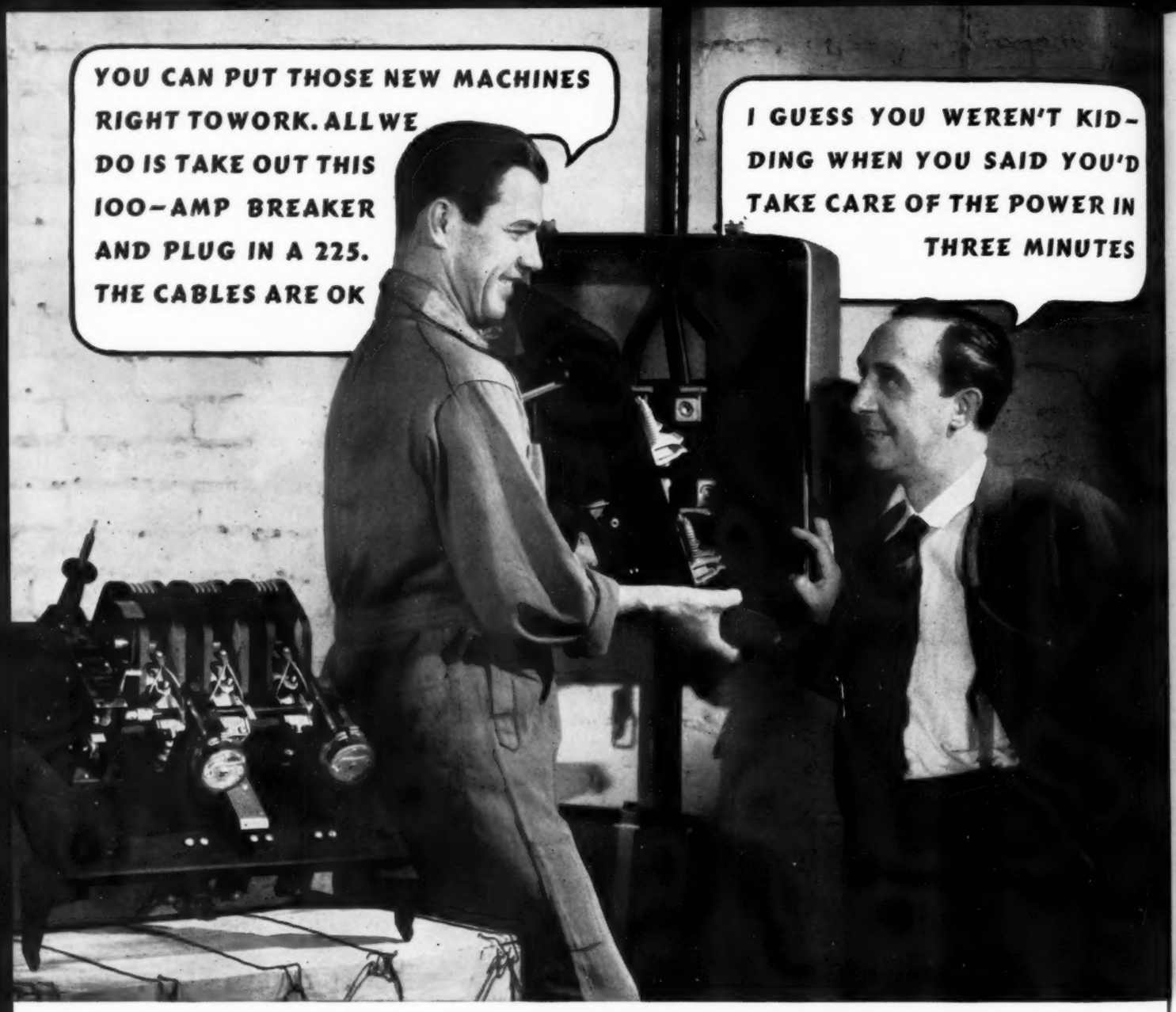
Electrical Contracting

THE MAGAZINE OF ELECTRICAL CONSTRUCTION

MARCH · 1942

Housing for war industry workers races new industrial and military projects to completion. Quality in workmanship and materials is vital. Good wiring holds down future maintenance demands for scarce materials and skilled labor. See Page 17.

INDUSTRIAL ELECTRIFICATION SECTION PAGES 59-74

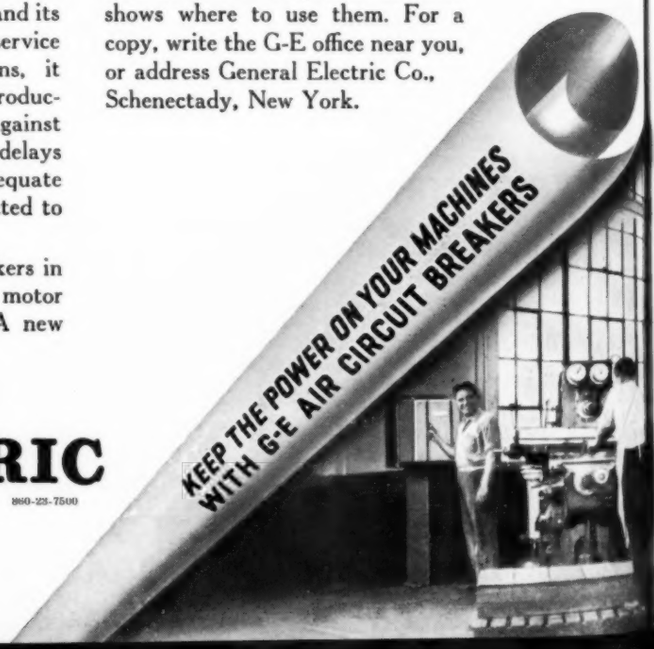

YOU CAN PUT THOSE NEW MACHINES RIGHT TOWORK. ALLWE DO IS TAKE OUT THIS 100-AMP BREAKER AND PLUG IN A 225. THE CABLES ARE OK
I GUESS YOU WEREN'T KID-DING WHEN YOU SAID YOU'D TAKE CARE OF THE POWER IN THREE MINUTES

Keep Up with Shifting Loads with This New Removable Breaker

WHEN plant loads grow rapidly and shift quickly—as they do today—your breaker capacity must keep in step. If it lags behind, shutdowns and loss of valuable production time soon catch up with you! That's another reason why we built this *removable* breaker, which permits interchanging different-rated breaker units—in *less than three minutes*—to meet new load conditions.

This new breaker is equally easy to install, operate, and inspect. Because of its unique flexibility and its ability to quickly restore service after protective interruptions, it saves valuable minutes of production time daily. It protects against the damage and prolonged delays often caused when less adequate protective devices are subjected to severe short-circuits.

Install these new AE-1 breakers in your lighting, power, and motor circuits—up to 600 volts. A new booklet (GEA-3600) tells how and shows where to use them. For a copy, write the G-E office near you, or address General Electric Co., Schenectady, New York.

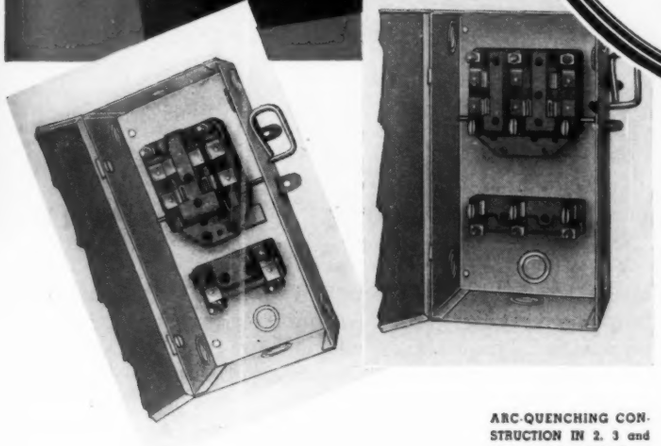


THE BREAKER WITH THE DISCONNECT FEATURE

GENERAL ELECTRIC

860-23-7500

GOOD, SOUND DESIGN, plus SAFETY!



ARC-QUENCHING CONSTRUCTION IN 2, 3 and 4 Pole 30, 60 and 100 Amp. SAFETY SWITCHES

SKETCHED above is the switch block from a Murray Single Throw, Fusible, Type D, Safety Switch. In the circle, is its outstanding feature—the double break blade and arc quenching chamber.

Each blade is provided with a double break—the arc is broken into two parts. The burning action is greatly reduced by this feature. Whatever arc is formed at each of the two breaks is drawn into a narrow slot in the mounting base where it is lengthened-out and cooled—the two effects co-acting to quench the arc almost instantly.

This arc-quenching construction coupled with those Murray Switch characteristics as, ample wiring room, properly placed knockouts, good-looking cabinets, assure the contractor the satisfaction that comes from a first-class installation. Metropolitan Device Corporation, Brooklyn, N. Y.

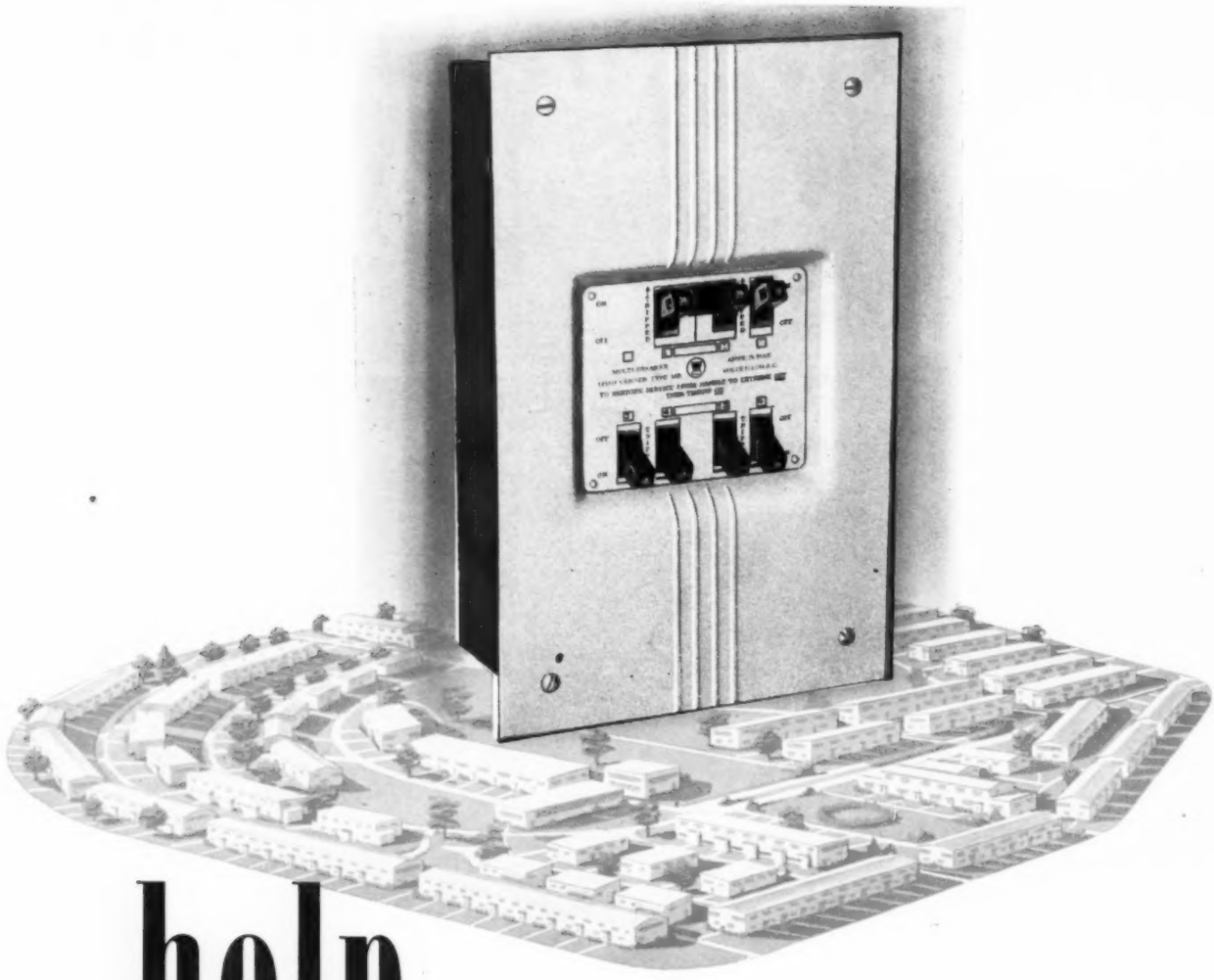
Murray

SAFETY SWITCHES

THERE ARE MURRAY JOBBERS EVERYWHERE

Buy WAR BONDS and STAMPS today!

ELECTRICAL CONTRACTING, Published monthly, price 25 cents a copy. Vol. 41, No. 3. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42nd Street, New York, N. Y. Subscription Rates—U. S. A., and Latin-American Republics, $2.00 a year, $3.00 for two years, $4.00 for three years. Canada $2.50 a year, $4.00 for two years, $5.00 for three years. Great Britain and British Possessions 18 shillings for one year, 36 shillings for three years. All other countries $3.00 a year; $6.00 for three years. Entered as second-class matter August 29, 1936, at Post Office at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. Copyright 1942, by McGraw-Hill Publishing Company. Cable address: "McGrawhill, New York." Member A. B. P. Member A. B. C.



help.....QUICK

IN MEETING YOUR DEFENSE REQUIREMENTS

When defense housing or other contracts call for prompt delivery of circuit protection equipment, you can depend on Westinghouse Nofuze Load Centers. They meet the most exacting specifications—and they are readily obtainable. Whether it's a single load center or equipment for an entire project, your Westinghouse Agent stands ready to help you—quickly.

Westinghouse Load Centers are delivered to you ready for quick installation. Ample knockouts in top, bottom and sides facilitate the drawing of conduit or armored cable. In fact, wiring is so easy that installation requires only the use of a screw driver.

Your Westinghouse Agent offers a complete line of load centers for modern housing applications. Feel free to call on him for help in your circuit protection requirements. He'll be glad to co-operate on any priority problems that may arise. Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa. J-60489

A TYPE FOR EVERY JOB!

Westinghouse Nofuze Load Centers are available for Service Equipment where six circuits or less are permitted without use of a separate service device and for general lighting control of from 2 to 16 circuits.

Westinghouse

NOFUZE CIRCUIT PROTECTION

Match the insulation to the job

From the Equator to the Arctic, Uncle Sam matches the uniform to the job.

Matching the right insulation to the job is equally important. For instance, the best moisture-resisting insulations are not the most suitable for very high temperature service. And, there are many other factors to consider—resistance to oil, acid, alkalis and corrosive vapors, as well as dielectric strength, flexibility and mechanical strength . . .

For the correct answer to your particular insulation problem, specify "Westinghouse." With that one key word, you gain access to a wealth of exact application data plus the experience of years in the research, manufacture, repair, and maintenance of every type of electrical equipment.

Westinghouse offers the most complete line of Insulating Materials in the world, from varnishes and cements to micas, fabrics, and tapes. These materials are carried in stock by your near-by Westinghouse Agent.

To help you with your insulation problems, there is an experienced Westinghouse Insulating Material Specialist assigned to your district. Use him! Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-06321

Westinghouse

INSULATING MATERIALS

How to make money on speed

Any Electrical Contractor Who Knows How to Do Wiring Has a Big Profit Opportunity Today...There Is a Big Need for Speed in Intercommunication . . . Sell Teletalk and Make a Profit on the Wiring and the Installation, Too.

Every electrical contractor, regardless of where he is located, is surrounded by industrial concerns who are engaged in war work to some extent. These people are busy. They are rushed. They are being pushed for greater production. And to meet the demands they have to reduce time, steps and energy consumed in the normal transaction of their business.

These people need Teletalk. And there are a lot of them right around you.

Demonstrate Teletalk to them. Show them how easy it is to operate, how fast it is in action, how quickly they can issue instructions, make requests, gather information that ordinarily means a lot of steps on their part or on the part of their employees, that means tieing up their switchboard, thereby handicapping important incoming and outgoing calls. Do this and Teletalk will sell itself.

Your distributor will give you full details on the many Teletalk models that are available, ranging in capacity from 5 to 24 stations—each model available with features found in no similar system.

And don't forget this—that not only is there a good profit in selling Teletalk, but there is a good profit in the wiring, conduit and other materials necessary for its installation as well as a very creditable number of man-hours of labor upon which you can also make a desirable profit.

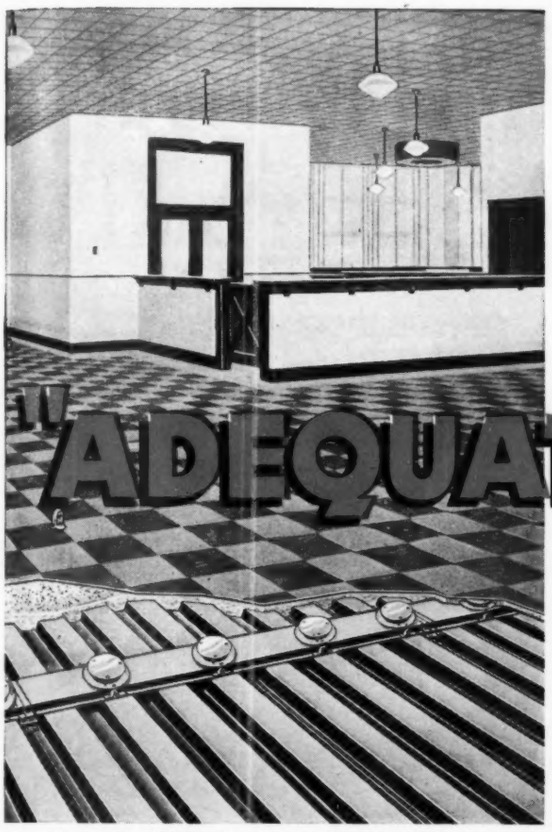
If your local distributor cannot supply you with complete details as to this profitable operation, write us direct.

Licensed under U. S. Patents of Western Electric Company, Incorporated, and American Telephone and Telegraph Company

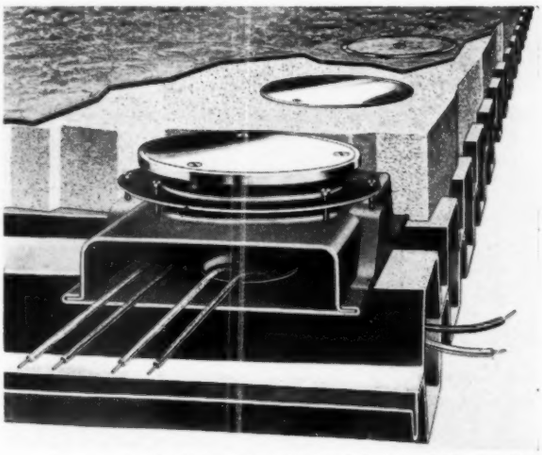
WEBSTER ELECTRIC COMPANY, Racine, Wisconsin, U.S.A. Established 1909.
Export Department: 100 Varick St., N. Y. C.
Cable Address: "ARLAB" New York City

WEBSTER ELECTRIC

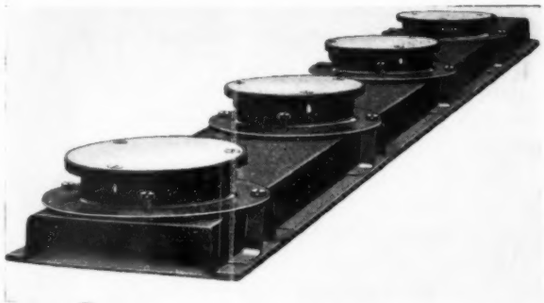
"Where Quality is a Responsibility and Fair Dealing an Obligation"



Showing how Q-Floors form a series of cellular steel wiring raceways which extend over the entire floor area.



Showing details of adequate wiring in Robertson Q-Floors which make it possible to install electrical floor outlets in any 6-inch square over the entire floor area.



Showing details of a standard Floor Header with hand holes through which every large-capacity, steel enclosed wireway in Robertson Q-Floors can be reached.

HOW Q-FLOORS provide for "ADEQUATE WIRING" permanently!

• Q-Floors are *always* electrically alive, never can become obsolete, for they provide 100% electrical availability, this year, next year, and every year after. How they provide "Adequate Wiring" permanently is illustrated here. Of themselves, Q-Floors form a series of cellular steel wiring raceways which are easily accessible through a system of headers or cross channels. Every type of wiring, both high and low tension, can be carried through floor outlets to any 6-inch square over the entire floor whenever needed.

So rapidly have come new electrical developments that few buildings have kept pace with them. As a result many structurally sound and relatively new buildings are obsolete today . . . because the floors fail to provide for *adequate wiring.*

Q-Floors are the cure for such obsolescence. They mean greater profits for you and greater satisfaction for your customers.

Electrical Fittings for use with Robertson Q-Floors are sold to General Electric construction materials distributors. For information about these fittings—and how they can be used to obtain adequate up-to-date electrical wiring—get in touch with the nearest G. E. Merchandise Distributor.

H. H. ROBERTSON COMPANY

FARMERS BANK BUILDING • PITTSBURGH, PA.

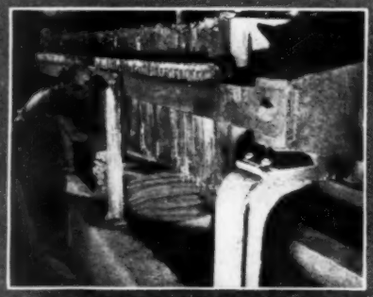
ROBERTSON Q-FLOORS

H & H Electrical PORCELAIN PLANT

WHERE ALL THE PORCELAIN PARTS ARE MADE FOR H&H WIRING DEVICES

Plant located at Washington, New Jersey.

Raw materials from eastern United States and clays from England are separately stored in bins; being carefully weighed out in preparing the body mixes.

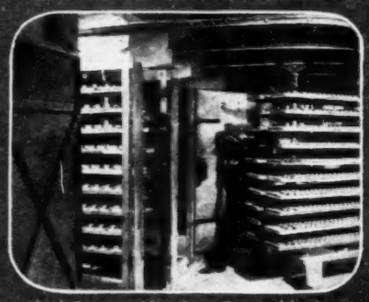


Body mixes are processed through a filter press to reduce water content; change body mix from liquid to solid state. Here, cakes being taken from press.

Cakes taken from filter presses are thoroughly dried on steam-heated dryers. After drying, the material is taken off and made ready for the next step, cracking.

Dried body mixes are cracked and put down in layers, each layer carefully wet as laid down, preparatory for use as finished material for molding into shape.

The prepared body material is pressed in a tool steel die to close tolerance limits, forming the designs of the porcelain pieces; then placed on boards to dry.



After being pressed into shape, the porcelain pieces are thoroughly dried on steam-heated dryers. Ware is fed to dryers on Press Shop side, progressively.

Small burrs or fins which form around edges of holes are cleaned off the porcelain pieces before firing. Then pieces are forwarded by belt for glaze-spraying.

The ware is placed on spindles for glazing. As table of glaze machine revolves, the porcelain passes under a spray of glaze; is then ready for firing operation.

The porcelain pieces are packed in "saggers" (earthen pots), and placed in kilns for firing continuously for 52 hours at a maximum temperature of approx. 2300° F.

After firing is completed and kilns have cooled, the saggers filled with finished porcelain ware are drawn from kilns; their contents inspected, packed, shipped.

PORCELAIN plays the largest part in many types of Wiring Devices, where attractiveness *and* utility attach to durable, rightly-designed porcelain bases or shells. In H & H Lines, we insist that the porcelain parts shall reflect the Quality of the *mechanical* parts and structurally uphold it. So we operate our own porcelain plant, to give this really *"basic"* support to porcelain-mounted devices. Another guarantee of VALUE through coordinating all parts-making.

HART & HEGEMAN DIVISION

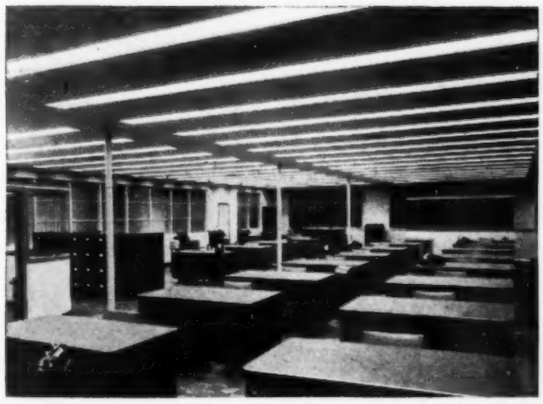
ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN.

Guth

FLUORESCENT LIGHTING
VITAL WEAPONS
FOR THE ARMY THAT WORKS INDOORS!

UNCLE SAM'S Victory Drive is being fought on land and sea over the face of the globe. In addition, a mighty important part of it is conducted right here at home—*indoors*—at lathes—in warehouses—in drafting rooms—in offices—yes, and in stores, too, where tense, brave women go for the soothing influence of a new hat or the makings of a substantial dinner.

The members of this indoor army are fighting with eyes and nerves—and they need the kind of weapons which will protect them against eye strain and nervous exhaustion—GUTH Fluorescent Lighting is daily proving its importance in the battle. Already, *the biggest part of GUTH Lighting Equipment is being used for wartime purposes!*



Office Efficiency Increased 15%

Here is a typical GUTH Fluorescent Installation in a typical American office (name on request). Of their new lighting, the company's president says, "Efficiency of office workers has increased 15%! and we are now receiving applications for work from the very best help in town, the strongest attraction being the comfortable working conditions."

40th Anniversary of Guth Lighting Leadership

THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis, Mo.

WHAT 5¢ CAN MEAN TO YOUR FUTURE

HOW MUCH ALUMINUM we are making now is a censored secret. We are determined it shall be sufficient to the need.

HOW MUCH WILL BE AVAILABLE, after the war, is idle talk now.

THE PRICE OF ALUMINUM is the thing that's important. It is important to the war, because our reduction of the price of ingot from 20c to 15c is saving the Government many millions of dollars a year.

THAT FIVE CENTS doesn't make aluminum one whit more useful for war purposes—only more patriotic.

BUT IT DOES MAKE aluminum terribly important to the peace. Real peace means jobs for all. Jobs-for-all come into being only when people *want to* buy and *can* buy: Which means new things, better things, at a price.

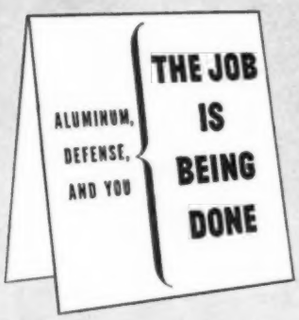
IMAGINEERING is the word we have coined to describe the thinking which is used to get those new things ready. Imagineering is letting your imagination soar and then engineering it down to earth. Imagineering needs tools as well as brains.

THAT FIVE CENTS we've lopped off the price of aluminum, so far, has more potentialities of creating new things and better things, at a price, than any single thing we know of.

THAT'S WHERE YOU COME IN. You are the man *who*. You are the man America is counting on to make the jobs Americans are going to need. You are the man who is going to do the *Imagineering,* in your specialty, that is going to win the place for yourself, your employees, your associates.

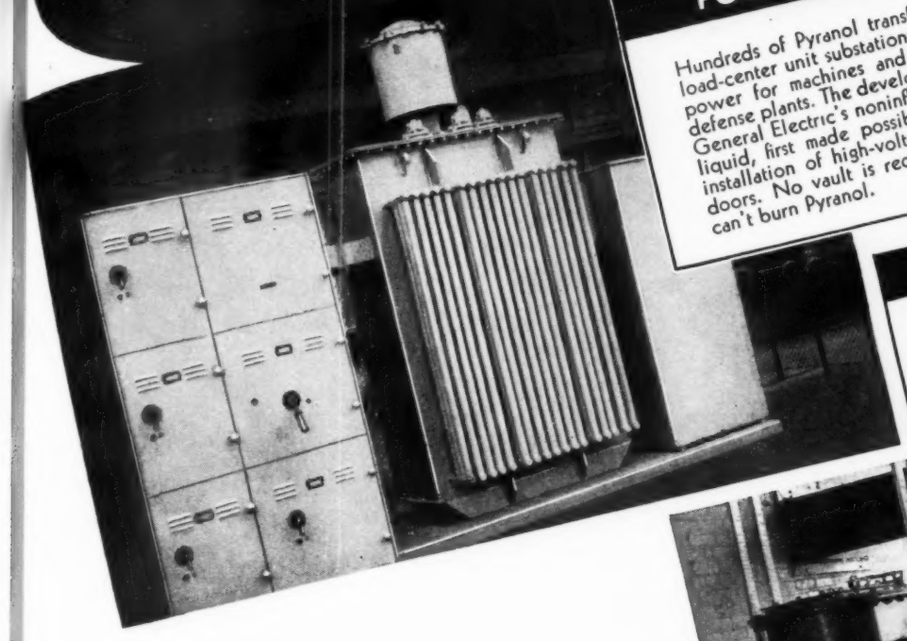
YOU ARE GOING TO DO IT, and we hope you are going to let Alcoa help. We can, and we want to.

Aluminum Company of America, 2197 Gulf Building, Pittsburgh, Pennsylvania.



ALCOA ALUMINUM

Why the Rapid Growth in the Use of
PYRANOL TRANSFORMERS?

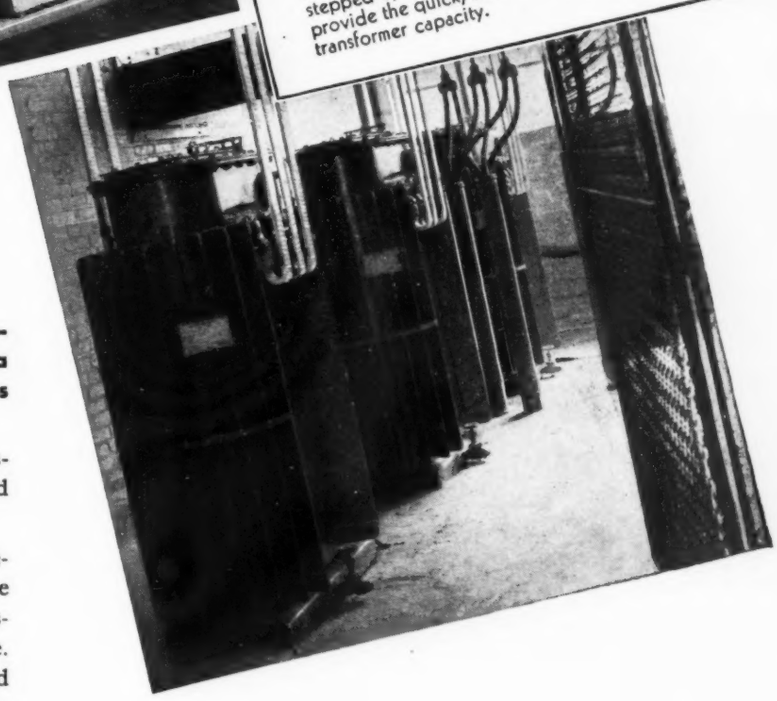


FOR NEW PLANTS

Hundreds of Pyranol transformers—in G-E load-center unit substations—are supplying power for machines and lighting in new defense plants. The development of Pyranol, General Electric's noninflammable insulating liquid, first made possible the economical installation of high-voltage transformers indoors. No vault is required, because you can't burn Pyranol.

FOR PLANT EXPANSION

When this plant needed more power, it installed these Pyranol transformers indoors. They bring primary power close to the load. Long runs of heavy secondaries are eliminated, effecting major savings in copper. For plants that must have more power for stepped-up production, Pyranol transformers provide the quick, safe method of increasing transformer capacity.



HERE'S WHY

PYRANOL* transformers can be installed indoors—right at load centers—without a fireproof vault. This speeds installation and saves materials, particularly copper.

Pyranol is noninflammable, and no Pyranol transformer in the 10 years since Pyranol was introduced has burned, or contributed to a fire.

Pyranol transformers require little, if any, maintenance. Pyranol is nonoxidizing and nonsludging. The pressure-tight tank protects vital parts of the transformers against moisture, dirt, dust, and sabotage. Immersion of the transformer interior in the liquid Pyranol prevents drying and cracking of the winding insulation.

Pyranol transformers have high dielectric strength, both at normal frequency and impulse, which means greater ability to withstand voltage surges that originate from switching operations or lightning.

The heat-storage capacity inherent in liquid-filled transformers makes Pyranol units ideal for sustained emergency overloads.

The reliability of Pyranol transformers has been proved by 10 years of service. Total installed capacity of Pyranol transformers is more than 2,000,000 kva.

For complete information on Pyranol transformers for your requirements, consult your G-E representative. Or, write for Bulletin GEA-2048C. *General Electric, Schenectady, N. Y.*

*Reg. U.S. Pat. Off.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

402-40-5100

USE EXTRA PRECAUTION BY OPERATING PROTECTIVE FLOOD LIGHTING WITH ★ *Automatic Control*

Revere Electric Mfg. Co. Photo

Changing its setting automatically, Form KAZ astronomic dial time-switch will operate in accordance with sun-set and sun-rise.

Current interruptions up to 10 hours will not stop Form VSWZ astronomic dial time-switch, nor affect its "on" and "off" settings.

SANGAMO TIME-SWITCHES

It is in the interest of the Victory program that vital property such as industrial building approaches, railroad sidings, and storage yards, be protected by lighting. As an extra precaution, automatic control—Sangamo Time-Switches—should be used to operate protective floodlighting installations. Fully automatic in operation, Sangamo Time-Switches eliminate the factor of human forgetfulness, as well as the necessity of frequent manual settings and adjustments. Being complete, the Sangamo line of time-switches enables the selection of the form best suited for any specific requirement.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

Introducing THE NEWEST DEVELOPMENT IN WIRING FOR ADEQUATE LIGHT AND POWER

Pierceway
4 ADEQUACY CONVENIENCE ECONOMY SAFETY

Each section of Pierceway Sectional Plastic Wiring has a male and a female end. Only two basic materials are used in this new adequate wiring system—copper tubes in 2 or 3 wire circuits to conduct the current, and non-conductive plastic for the attractive housings.

SECTIONAL PLASTIC SURFACE WIRING SYSTEMS

INDUSTRIAL

COMMERCIAL

RESIDENTIAL

DISTINCTIVE FEATURES

- AMPLE CAPACITY
- PLENTY OF OUTLETS
- EXTRA INSULATION
- MECHANICALLY STRONG
- NON-METALLIC ENCLOSURES
- NO GROUNDING NEEDED

WRITE FOR THIS ILLUSTRATED DESCRIPTIVE CATALOG

With PIERCEWAY, plastics enter the electrical wiring field and solve some of its biggest problems. Here is surface wiring that provides the ample capacity and adequate outlets demanded by the increasing use of better light and portable electrical equipment—in a neat, compact system that is adequate, economical, convenient and safe.

Pierceway Sectional Plastic Wiring is made in standard 16-inch sections, with 2 outlets to each section, providing an outlet for every 8 inches of circuit run.

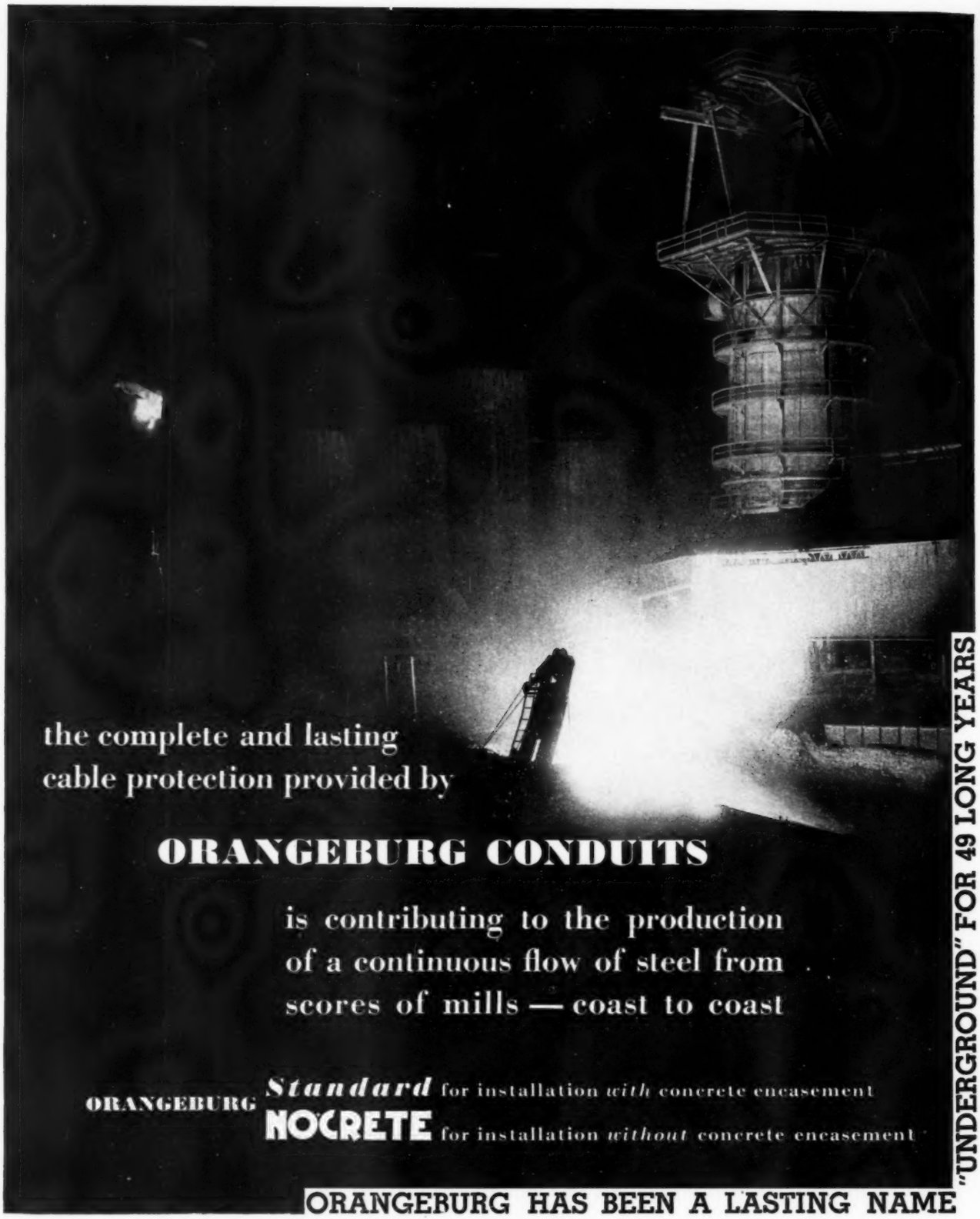
Assembly and installation are easy and quick. On existing walls or ceilings, Pierceway is mounted on the surface. In new construction, it can be mounted on studding or masonry, with plaster finished flush with the face of the plastic Pierceway housing.

The current-carrying capacities of Pierceway Sectional Plastic Wiring are as high as 35 to 45 amperes in continuous operation—and the non-conductive plastic housing establishes a new standard of wiring safety.

PIERCE LABORATORY, INC., SUMMIT, NEW JERSEY

Eastern Sales Office
40 WEST 40TH ST., NEW YORK, N. Y.

Western Sales Office
444 NEW CENTER BLDG., DETROIT, MICH.


the complete and lasting
cable protection provided by
ORANGEBURG CONDUITS
is contributing to the production
of a continuous flow of steel from
scores of mills — coast to coast
ORANGEBURG Standard for installation with concrete encasement
NOCRETE for installation without concrete encasement
"UNDERGROUND" FOR 49 LONG YEARS

ORANGEBURG HAS BEEN A LASTING NAME

THERE ARE EXTRA PROFITS FOR YOU
IN EVERY *"time-and-material-saving"* FOOT OF

ORANGEBURG *Conduits*

MADE AT ORANGEBURG, NEW YORK, BY THE FIBRE CONDUIT COMPANY, 292 MADISON AVENUE, NEW YORK CITY
Sales Agent — Distributors
GRAYBAR ELECTRIC CO., INC. GENERAL ELECTRIC SUPPLY CORP. 3-FC-1

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Established 1901

MARCH, 1942

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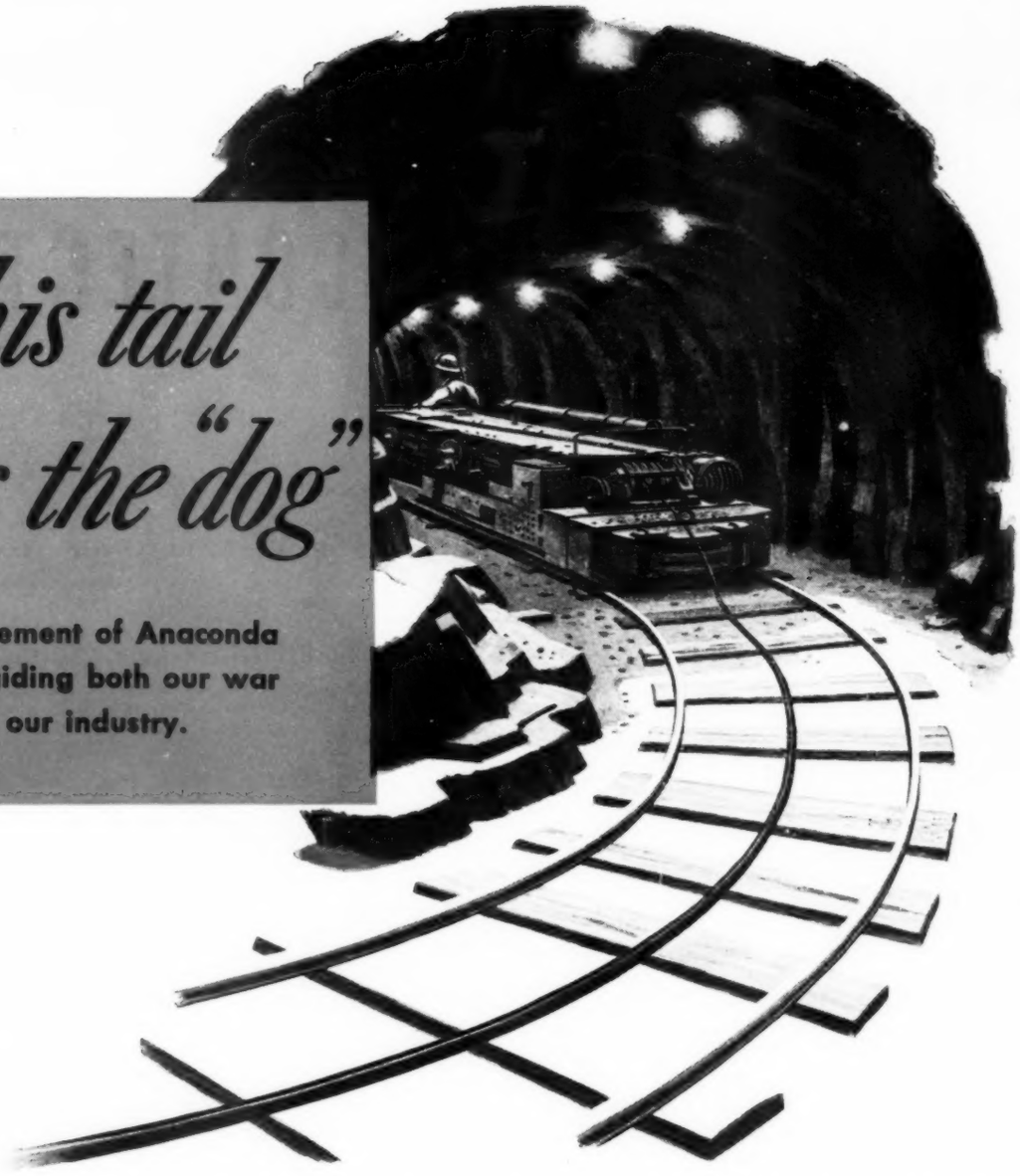


This tail wags the "dog"

An achievement of Anaconda research aiding both our war effort and our industry.

MINES . . . one of the necessities of our gigantic war effort . . . today rumble with the noise of *work*. To keep this rumbling rhythm steady and incessant, mining machines and transportation systems use large quantities of electrical power.

Here, a bustling locomotive carries its electrical power around with it . . . like a tail. Over sharp-edged rails, thumping over shaggy, splintered ties, reeling and unreeling as the locomotive moves back and forth, the "tail" . . . the copper power cable . . . stands up day after day delivering the ever-so-vital power without interruption.

Sunex Securityflex*, a product of Anaconda research developed to withstand not only the rough and tumble conditions of underground mining but also the sun blistering service of open pits, is the "tail" that's wagging many mining dogs. And the research that built it, the invaluable hours of patient experimenting and testing, now speeds to develop copper wires and cables for an even more potent war effort . . . for a greater industrial front . . . for use in mines, in war-vital plants, in bombers and battleships. 42243

*Trade Mark Reg.

ANACONDA
from mine to consumer

This familiar trade-mark symbolizes the best efforts of modern research and production.

ELECTRICAL WIRES AND CABLES OF COPPER ARE THE LIFE LINES OF OUR NATION

ANACONDA WIRE & CABLE COMPANY

Subsidiary of Anaconda Copper Mining Company

GENERAL OFFICES: 25 Broadway, New York City • CHICAGO OFFICE: 20 North Wacker Drive • Sales Offices in Principal Cities

TIME IS SHORT

Our Golden Months, the days before Pearl Harbor, are gone, largely wasted. The crucial days of the war are here, now and in the remaining months of 1942. What American industry produces in these "ten silver months" is ten times as important as what it can do in 1943. For in this swiftly moving period of military time the fate of our people, our homes and our institutions may be determined.

The metaphor is Donald Nelson's, used in a grim discussion of industrial conversion. Washington planners are frankly appalled with the magnitude of the change-over job ahead. The most urgent problem before the War Production Board today is what each of our 184,000 industrial plants, factories and shops might be making now for the war effort.

Initiative, the kind of business audacity combined with mechanical and management genius that we think of as typically American, is sorely needed. It must stem from industry. Speed-up, sub-contract and pool are the official orders of the day. For if our conversion job is to be done in time it cannot wait for detailed plans and procedure to be handed down from Washington. It must be done now, by the man who has the all-important "know-how," by the ordinary, average, modest, but amazingly skillful American business man.

We can't ignore the problem. The whole electrical construction industry is up to its eyelashes in responsibility for speedy and effective help to the plants which must change over to war work. We can't wait for them to invite us to bid on fully developed plans. We must be in there with our coats off while conversion plans are in the making. That's not easy. It takes smart salesmanship. But it's our job.

And furthermore, we have a critical job of conversion within our own ranks. There are too many thoroughly capable, well organized electrical firms that haven't yet found their place in the war effort. The jobs in their areas have been too large, or their facilities too highly specialized, perhaps, for them to undertake major contracts alone. A cooperative system of joint ventures, sub-contracting and pools could mobilize these industry resources over night.

With considerable logic, it has been repeatedly emphasized that we are too individualistic, which is a nice word for pig-headed, to work effectively in multiple harness, or for each other. Yet the experience of actual cooperative ventures has proved that they work efficiently and profitably.

We have ten silver months during which the output of American industry must be turned to war. The wiring job ahead will take every resource we have. The mobilization of the electrical construction industry, however, can be accomplished in ten days—if we have the heart for the job.

HERE'S HOW GraybaR CAN HELP YOU SPEED UP DEFENSE JOBS—*Electrically!*

Your GRAYBAR Man makes it his business to keep informed on the specifications for electrical supplies and equipment that meet the requirements of the Army, Navy and other bodies concerned with defense plant construction and operation. In addition, GRAYBAR's long experience in furnishing material for large industrial plants of every type results in an understanding of what's preferred in the way of power distribution, lighting, motors and motor control, signaling systems.

When a GRAYBAR representative checks over your needs on any job, he does so with a realization of the delivery situation existing on different types and makes of supplies. Frequently, he can suggest acceptable alternatives in the choice of material that will eliminate serious delays. At each of its 87 offices, coast-to-coast, GRAYBAR is out to give its customers the action-service that the times require.

GRAYBAR *in over 80 principal cities*

Executive Offices:
GRAYBAR BUILDING
NEW YORK

"Ten Silver Months . . ."

"EVERY WEAPON we make today is worth ten that we might produce next year; for this year – 1942 – is the critical year in the existence of the United States."

This grim challenge was thrown at American industry by Donald Nelson in his first speech as chief of the War Production Board. He was speaking to a group of business paper editors, called together to receive at first hand Mr. Nelson's urgent message to the industries they serve.

"We've wasted the golden months", he declared, "the months in which we could have expanded our steel industry, our chemical industry, our copper industry, and all the others, so that we would have plenty of everything. But we still have ten silver months – the months that remain in 1942–and in them we can do things that we never thought possible."

To that objective Mr. Nelson has dedicated his high talents and boundless energy. And to that task he asks American industry to apply the full measure of its resources and skill.

That challenge should be all that it takes to exact from industry the last ounce of its energies. For by now we all can see that in this war the American way of life is at stake. American industry is the essence of the American way of life. Neither can survive without the other. So, even if it had no better reason, industry must go all out to win this war as a measure of self-preservation. Here self-interest and patriotic duty are synonymous. American industry cannot afford to let America lose this war.

The 1942 job is crucial. If it is well done we have a chance to win. If it is badly done we cannot possibly win. There is the measure of the responsibility that now rests upon the shoulders of industrial management.

It is not just Donald Nelson who asks this of industry. He speaks for the millions of fighting men – on land, at sea, in the air – the world over, whose eyes turn so desperately to the workshops of America. There and there alone can they see the hope of victory.

The people of America are not going to let those men down. They demand of industry every effort and every sacrifice that may be necessary to back them up. On that score, American industry stands, of necessity, on trial before our people. It must come through – or else!

* * *

As industry goes all out to meet this demand, its management asks of those who set its tasks and supervise its performance the utmost possible cooperation. It asks of them specifically an understanding of its problems and a chance to work them out without unnecessary interference. It asks for protection against attack from the rear while it concentrates its energies against the common foe. It asks a truce on economic reforms and social experiments that have nothing to do with winning the war and that are bound to arouse misgiving and mistrust amongst the proprietors of industry. Above all, it asks that it be not made a political scapegoat for every deficiency that is sure to develop in the confusion of a war effort.

This does not mean that industry resents honest criticism or constructive direction. Neither does it mean that it is unwilling to do its best unless it can have its own way in all things. The managers of industry are practical men. They know better than anyone else that unprecedented conditions call for new methods, that they must be open-minded to every criticism sincerely directed toward winning the victory. They know that no one can afford to be smug in the face of a national crisis.

There would be no point to my rehearsing here the pros and cons of such criticisms. Time is too short for that. Only in its performance can industry write a convincing answer to its critics. But as a help toward the achievement of that performance, I should like to clear up, if I can, one prolific source of misunderstanding and mistrust.

I refer to the solicitude of industrial managers as to where their companies may find themselves after the war. *This concern for the future sometimes is misinterpreted to mean that management is blind to the urgency of the present. But it does not mean that. It is a perfectly natural anxiety that must be felt by any responsible management operating under the American enterprise system – which is one of the things we are fighting to preserve.*

Under our system, the managers of industry cannot but feel a sense of responsibility to its owners, not merely for current dividends on their investments but also for the conservation of their properties. That means they must feel some concern over what may happen after the war to a business that now must go all out to help win the war. And their concern is but part of a general concern over what may be the effect of the war on the whole American way of life, preservation of which is our reason for being at war.

To give practical effect to that concern under present conditions is one of the problems of management. It is not an insuperable problem. Competent management will be able to surmount it, I am sure. But the right kind of help from those in authority can make the job a lot easier. And let us note in passing that the problem cannot be written off, as some critics of business seem to think, merely by setting off against it the profits that business can make on war contracts. That misses the whole point.

For a business enterprise is not, as many seem to think, just a "profit-machine." It is not set up and operated by its owners and managers for the sake of this month's or this year's profits, without regard to any other consideration.

The fact is that any worth-while business must operate as a going concern. It consists not only of stockholders and managers, but also of employees, markets, distributors, and dealers. Mostly, I might say, of markets, distributors, and dealers. They are the "reason for being" of any business, the source of its payrolls and its profits.

No competent management wants to scrap such essential elements of its business just for the sake of war-bred profits, however large they might look . . . at the moment. Most of the original reluctance to get into arms production, for which industry has been criticized, was not due to a "greed for profits", as has been charged. Rather did it arise from management's mistrust of "war profits" that can be made only by sacrificing the essential elements of a healthy business.

* * *

But now industry faces a dire national emergency. The survival of our country and all its institutions – including American business–is at stake. So management must shape its course to meet without stint every need of the war

effort. That means it must subordinate to that effort every other concern. To lose the war is to lose all. We must first win the war if we would save anything.

To the men of management that presents a grave responsibility. It is fair to ask whether government can do anything to help them meet it. One simple thing I think government can and should do. It cannot dissolve all the concerns of management, but it can help substantially.

Government should do all it can to help management conserve those assets of business that will contribute to post-war reconstruction, when that can be done without prejudice to getting on with the war.

Let me explain. Broadly speaking, every business comprises three elements. One is its tangible assets – its factories, machinery, equipment, and materials. Another is its productive capacity – its management, organization, trained working force. A third is its intangible assets – the goodwill, familiarity, acceptance, and recognition that it enjoys amongst its dealers, customers, and prospective customers.

When the nation goes to war government becomes the one dominant customer of a business. Of these three elements, the first two – plant facilities and organization – become of paramount importance to the job in hand. But so far as the government buyer is concerned, the third drops to minor importance.

But that third element cannot be ignored by the managers responsible for that business. For it will be their mainstay when they must rebuild that business after the war, when government has lost all interest in its existence, except as a source of tax revenue. That is why government can help greatly if now, during the war, it recognizes the legitimate concern of management to conserve those assets that will be essential to survival after the war.

Everyone recognizes the obligation of government to demand that the individual business go all out for war production, to forbid the production of goods not essential to wage war and to commandeer those that are, to require that a business sacrifice its markets and disrupt its distribution organization. No one questions the right of government to restrict arbitrarily the amount of earnings that a business may retain as profit from its war activities. In short, no one questions the right of government to become the dominant partner in any business that may be needed to win the war and, as dominant partner, to put the national need above any conflicting interest of the business.

But, as it does all this, government should remember that the survival of that business is staked on the public's knowledge and use of those discontinued or commandeered products, on the stability of that crippled dealer organization, on the ability of the business to maintain its standing in a market-place from which, temporarily, it may be barred.

And government can help management to deal with the exacting task it now faces, if it will do all it can to avert the needless sacrifice of business interests that do not conflict with war needs, if it will but remember that one of these days, that business again will be on its own, gathering up whatever resources it may have left, recreating its markets, rebuilding its distribution channels, reestablishing itself as a going concern . . . and doing all this in a competitive world without benefit of war orders.

The only foundation upon which any business can hope to rebuild when that day comes is its customers' memory of its name and their understanding of its products. Whatever credit may be coming to it for its war effort will not avail it very much if it permits itself to be forgotten. Its chief assets in that day will be the identity, recognition, and acceptance it still enjoys amongst those to whom it must look for business.

That is why so many business men, already going all out on their war jobs, become apprehensive whenever some word or act of a legislator or government official seems to question the validity of their sales, promotion, and advertising activities during the war. For they know that it is by such measures alone that any management can hope to conserve – while its business goes to war – the values it will need when it returns to civilian service.

That is why I ask government to do all it can to allay such uncertainties, to reassure business of its desire to help conserve those intangible assets that mean so much to business security. For that, I believe, will strengthen the hand of management in a big way as it goes all out on the vital job Donald Nelson has staked out for industry.

* * *

He has told us that if we are to make these ten silver months productive enough to make up for the golden months that are gone, industry must do things it never thought it could do. That is dead right. For America now finds itself in a position it never thought it could be in.

All too slowly, but very surely, it is dawning upon us that this is OUR WAR. Moreover it was our war long before we knew it or did much about it. So our job today is not merely to match the current production of our enemies. That is not enough. We must produce also enough to match the surplus of resources they had built up before we got started. We must produce enough not only for our own needs, but also for all the United Nations.

Moreover we must produce all that we need for *decisive* victory, for anything short of that will mean defeat. If we would save the American way of life, we must destroy once and for all the forces that threaten it. A stalemate would mean but an armed truce and what that might do to the American way of life and to American industry no one dares to guess. Victory must mean *decisive* victory. And this, very definitely is our war.

And just as definitely, this is OUR YEAR. For in this year – 1942 – we must prevent our enemies from achieving an advantage that might put victory forever beyond our reach – despite all our vast resources. It is an appalling fact that victory may slip beyond our grasp – not in 1943 or in 1944 – but during the months just ahead of us.

"Industry's responsibility in all of this is great," says Donald Nelson. "The job will take brains and initiative, but we can do it if we go out with a will."

To Mr. Nelson, that initiative means that industry must lead rather than follow in the march to more intensive use of our machines and our man-power. We dare not wait for new facilities to meet our mounting needs. More and more we must press for more widespread subcontracting and conversion. And he is counting on that initiative, backed by ever more aggressive effort, to avert or to minimize the compulsory measures that now seem imminent.

"We must stop thinking about what we're going to do to the enemy in 1943 and start thinking of what we're going to do to him in March of 1942.We must make today the things we would be making next year . . . if we had the time to spare."

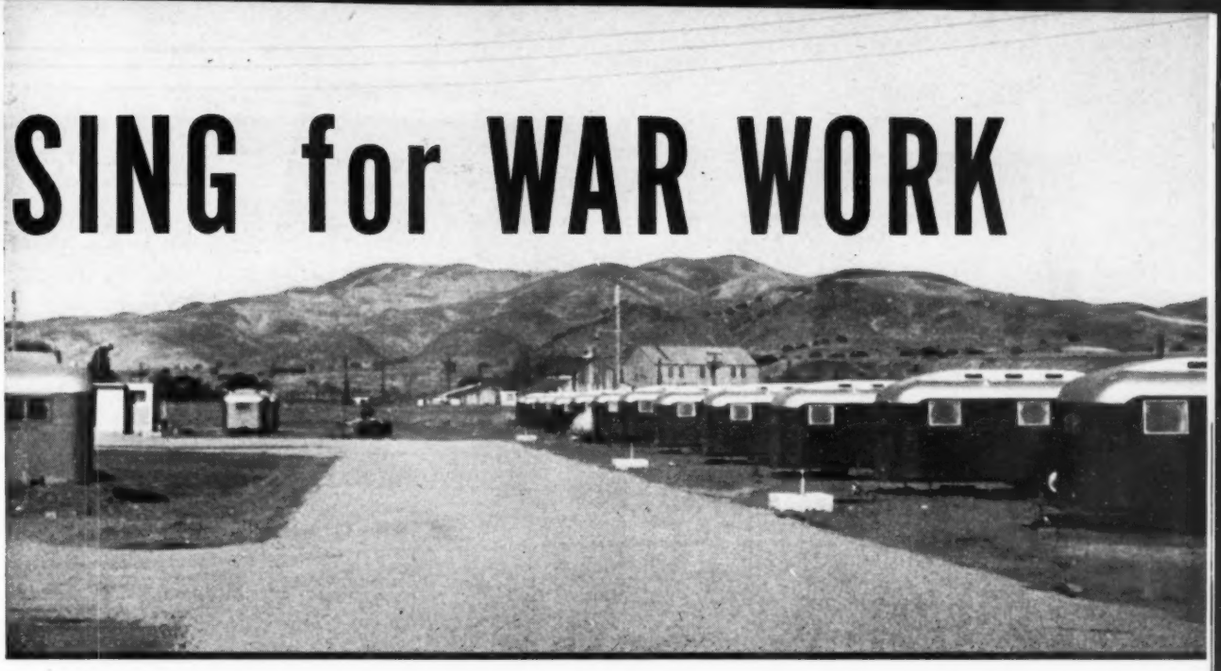
That, says Donald Nelson, is the task of American industry during the next "Ten Silver Months." And to that gigantic task American industry now must bend every ounce of its abundant strength.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

HOUSING for WAR WORK



Wiring for Pacific Coast mass housing for farm and war plant workers emphasizes good design and specification grade materials.

By W. A. CYR

HOUSING for workers in the expanding war production industries must be expanded along with those industries. New factories will spring up as the schedule of production announced by the President at the opening of Congress is put into gear. To supply them with labor, new housing facilities will be required for the workmen and their families.

Electrical contractors have handled all the wiring of the defense housing built by the Farm Security Administration, at least in Region 9 for the Pacific states. This agency, which started life as a medium to aid the farm population in its migrations and to provide adequate housing for farm communities and farm labor camps, was called upon by the government to turn its attention toward defense housing when this emergency started. It has already developed a very effective technique for handling of contracts and for the planning and design of its electrical work.

As a guide to contractors who may be engaged in future construction of this type, the procedure followed by the FSA may prove helpful.

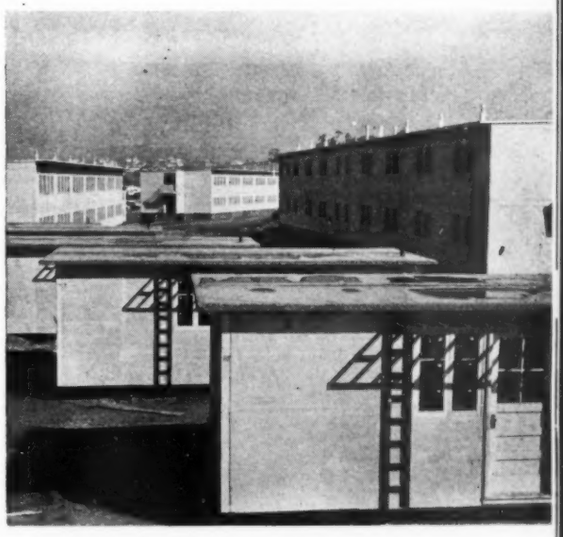
An interview with Scott Beamer, associate electrical engineer for Region 9, brought forth the policy and methods employed by the department in the handling of contract work.

"It has always been the purpose of the electrical department of Region 9 to maintain the highest possible standards in electrical work," said Beamer. "There is a definite purpose behind the high standards of FSA's requirements. The FSA does not maintain a line crew, nor even an electrician for trouble shooting. The work ordinarily must be planned and installed in such a manner as to give years of trouble-free service. High quality materials and installation are the only means available for building a system that is practically maintenance and trouble free.

"Now in this time of unlimited emergency, we are building defense construction. Power company line crews are swamped with work. Local electricians are lost for both time and material. There is no room for a poorly designed or constructed electrical job in this defense construction. Everybody will be kept busy just doing the important things without having to go back for maintenance.

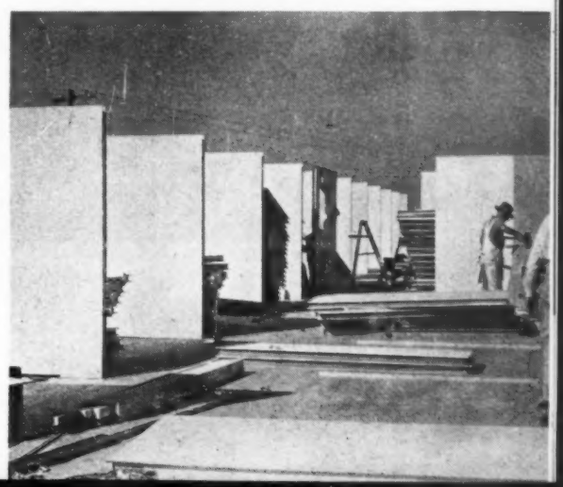
"Remember also that the electrical system pumps water to put out fires, keeps the street lights and exit lights burning to control crowds and panics. Electricity in defense housing and all other defense activities goes everywhere and does practically everything.

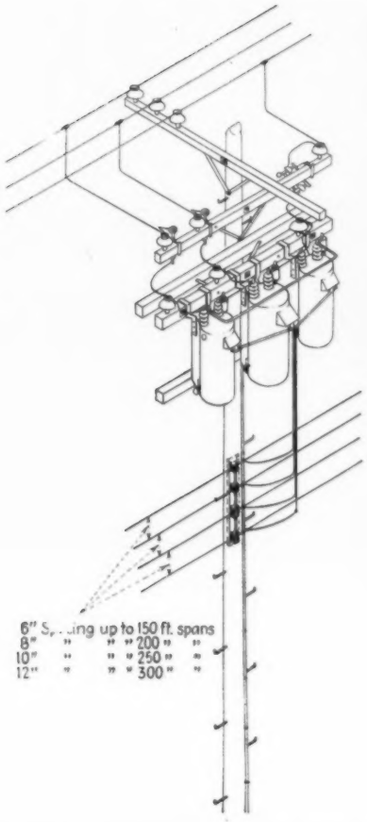
In explaining the standards of mate-

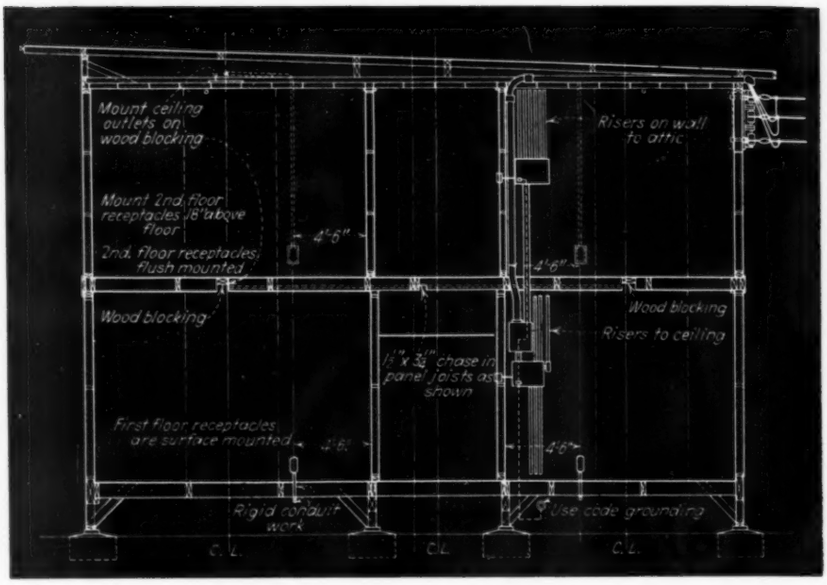


DEFENSE HOUSING *dormitories and small houses made of plywood sections.*

PLYWOOD WALL *sections, with outlets in place and metallic tubing stubbed up.*

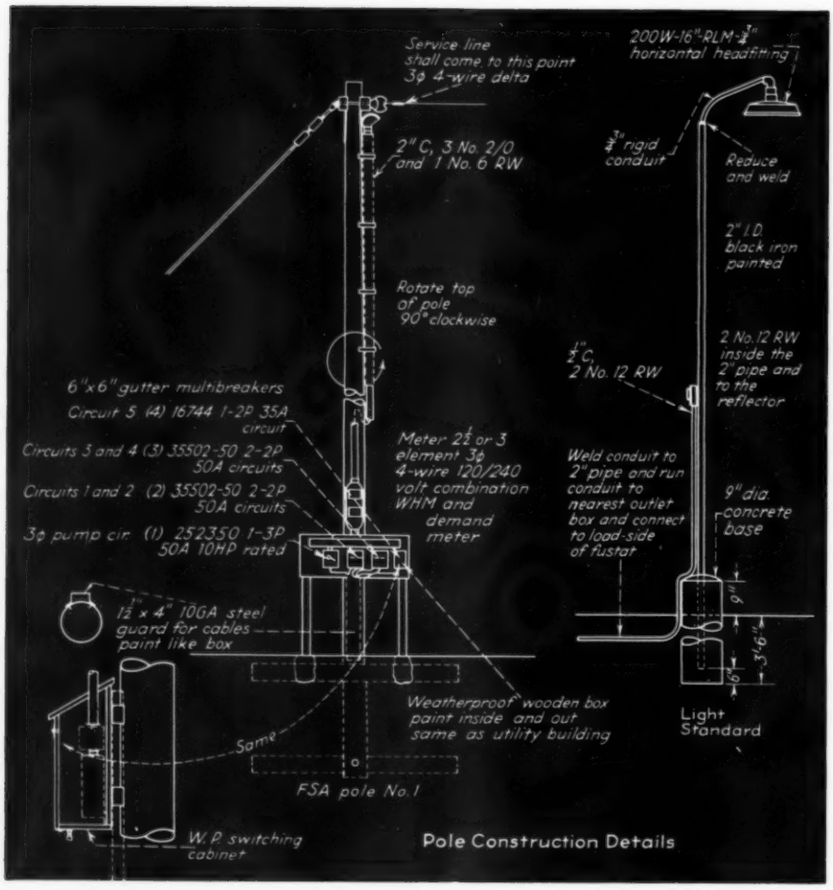






CROSS SECTION *of wiring layout for plywood dormitory buildings, showing distribution panel layout.*

CONSTRUCTION DETAILS *for pole line and exterior wiring at FSA projects, show every nut and bolt and require high grade materials.*


Service line shall come to this point 3φ 4-wire delta
200W-16"-RLM-¾" horizontal headfitting
2" C, 3 No. 2/0 and 1 No. 6 RW
¾" rigid conduit
Reduce and weld
2" I.D. black iron painted
Rotate top of pole 90° clockwise
1" C, 2 No. 12 RW
2 No. 12 RW inside the 2" pipe and to the reflector
6"x6" gutter multibreakers
Circuit 5 (4) 16744 1-2P 35A circuit
Circuits 3 and 4 (3) 35502-50 2-2P 50A circuits
Circuits 1 and 2 (2) 35502-50 2-2P 50A circuits
3φ pump cir. (1) 252350 1-3P 50A 10HP rated
Meter 2½ or 3 element 3φ 4-wire 120/240 volt combination WHM and demand meter
Weld conduit to 2" pipe and run conduit to nearest outlet box and connect to load-side of fustat
9" dia. concrete base
9"
3'-6"
6"
½" x 4" 10GA steel guard for cables paint like box
Weatherproof wooden box paint inside and out same as utility building
Light Standard
Same
FSA pole No. 1
W. P. switching cabinet
Pole Construction Details

DETAILS *of pole service to trailer camps, ground lighting standard and switch cabinet.*

rial and workmanship, it was pointed out that the FSA is specifying what it considers the best quality in workmanship and materials. In the distribution system, it requires:

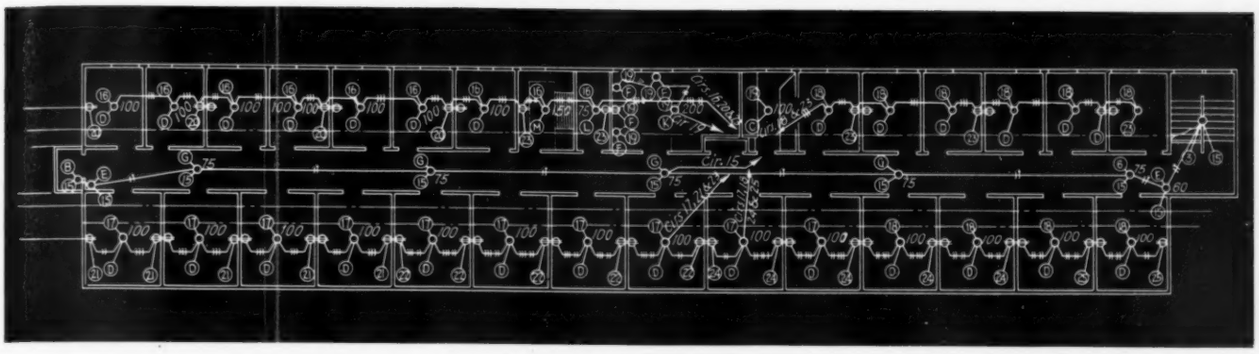
1. Completely self-protecting transformers.
2. Triple braid weather-proof type URC—hand-drawn line wire.
3. Mechanical line splicers and dead end loops.
4. Varnished cambric and specification grade friction tape, and air drying black varnish over every outdoor splice.
5. Wet process insulators and spools.
6. Heavy duty U-trough vertical line racks.
7. Three-bolt heavy duty guy clamps.
8. Heavy $\frac{5}{8}$-in. guy strands.
9. Western red cedar poles (ASA specification grade).

Methods of outdoor construction follow the state utility commission general orders and are based on those of the state of California's Railroad Commission, General Order 64-A. Further refinements are shown in a typical detail sheet in which every detail is plainly shown and specified so that the contractor may make no mistake about what is wanted.

Interior wiring material, for example, specifies the following:

1. Multi-breakers for circuit and feeder protection.
2. Specification grade wall switches with rubber handles.
3. Water-tight electric metallic tubing couplings and connectors where electric metallic tubing is used.
4. Specification grade splicing compound.
5. Specification grade friction tape.

The interior workmanship is all



FLOOR PLAN *of plywood dormitories, showing wiring layout. Each room has a ceiling and two convenience outlets.*

specified to conform to the National Electrical Code and local ordinances. Plans are carefully drawn and checked in order that they fully represent Code requirements. To make the specifications simple and exact, items are called for by manufacturer's name and catalogue number. Any substitutions must be taken up directly with the engineer before being accepted. In its drawings, the FSA shows details thoroughly, power company connections and metering facilities, even to boiler control wiring diagrams. The specifications are broken in four parts: Interior wiring materials and pole line materials, followed by interior and exterior workmanship requirements. The workmanship requirements point out the specific details, such as mounting of outlet boxes, wiring methods, requirements for locknuts and bushings, soldering, taping, splicing.

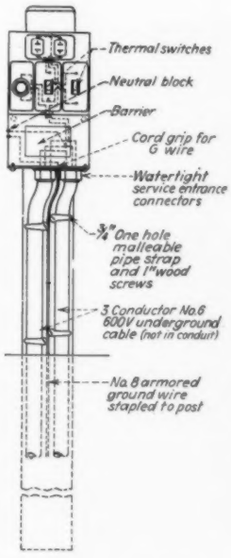
The administration's engineer makes it a practice, as soon as the contract is awarded, to call a meeting with the electrical contractor and his superintendent. At this time the contractor makes his general criticism of the plans, points out certain specific design details, ask questions, brings up Code interpretations. The designers can explain why certain things are being done as required and thus removes misunderstandings about the designers intent and the design of the job. Then the contractor can make his suggestions and ask for any special ruling and get express permission from the designer for them.

At some time previous to final inspection, a part of the electrical design personnel makes a preliminary inspection of the partially completed work. Pictures are taken, notes made, and these conditions are discussed on the job directly with the foreman or chief electrician. A contractor who is accustomed to quality work contributes directly to this cause and fits well into the program. "Slap-it-on" contractors, however, run into trouble. They receive a detailed letter carefully pointing out Code or specification violations by paragraph and page number. The letter ends with the words "and final payment will be withheld until all provisions of the plans and specifications are met."

"We feel," said Beamer, "that the competence of the electrical contractor and his work has a direct bearing on the welfare of thousands of people who eat, sleep and play trustingly under these distribution lines and in these houses. Whether the lines hold up in bad weather, whether the pumps keep running in case of fire, whether the pumps go in the sewer system, whether the streets and walks are well lighted, all rest on the contractor's shoulders and that of his supervisors. It is best to have this understanding beforehand."

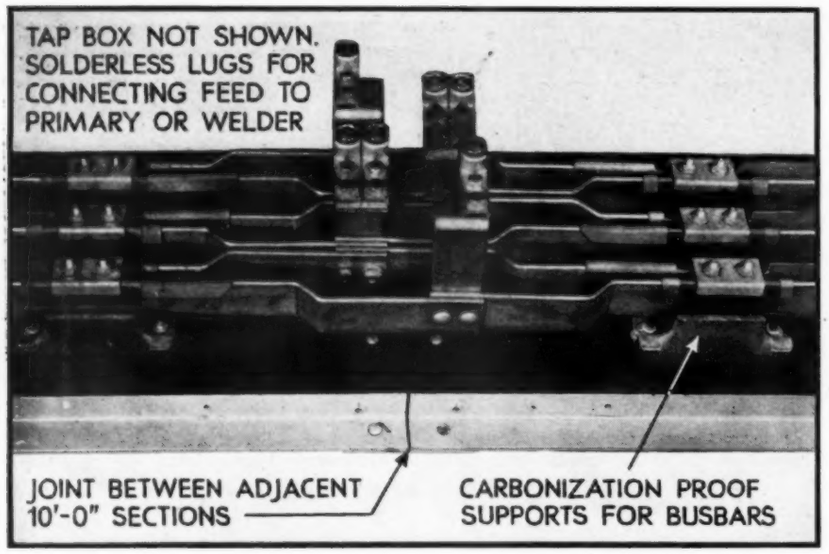
Among the types of projects carried on under FSA direction has been the outfitting of electrical facilities for temporary trailer camps. The government purchased several thousand trailers to be used as temporary housing in defense areas. Wiring facilities for these are provided at posts between each two trailers upon which are mounted switch and fuse cabinets and outlets for connection of the trailer to the wiring system.

Another ingenious housing development has been the fashioning of knockdown plywood dormitory buildings. Wall sections of plywood were made up with conduits and outlet boxes already installed, sections are assembled at the site. Conduit stubs are already in place above the ceiling line. The contractor on the job connects the circuit wiring above the ceiling line. These buildings were made up in 100-man dormitories 140 ft. long, 28 ft. wide. When the electrical work was done, it was a complete metallic tubing jobs.


Thermal switches
Neutral block
Barrier
Cord grip for G wire
Watertight service entrance connectors
¾" One hole malleable pipe strap and 1" wood screws
3 Conductor No.6 600V underground cable (not in conduit)
No.8 armored ground wire stapled to post

LOT OUTLET *detail for service box to supply electricity to a pair of house trailers. Cords from trailers are plugged in under a weather-proof cover.*

WIRING SERVICE *for apartment buildings and diagram of distribution for the entire group. Overhead lines serve the buildings. Apartments are separately metered.*


TAP BOX NOT SHOWN. SOLDERLESS LUGS FOR CONNECTING FEED TO PRIMARY OR WELDER
JOINT BETWEEN ADJACENT 10'-0" SECTIONS
CARBONIZATION PROOF SUPPORTS FOR BUSBARS

THREE-PHASE BUS *distribution for a low-impedance welding system shown with metal enclosure removed.*

Welder Busbar Distribution

By Richard C. Lipps

Engineer Trumbull Electric Mfg. Co., Plainville, Conn.

Some principles of low impedance welder busbar distribution systems. Points to consider in designing a continuous system of enclosed busbar to feed resistance welders.

THE use of bare copper busbar, suitably supported in protective metallic housing, has found increasing favor with the electrical trade for many uses. One field of growing interest has been in serving welder loads. Too frequently, the welding equipment, in itself, is blamed for "poor welds", whereas the answer may be in the electrical supply to the welding apparatus itself. It is necessary to obtain close voltage regulation, because of high instantaneous current values for very short-duty cycles. More care is required in the planning of a welder distribution system, therefore, than for normal loads of the known and more continuous types. This has brought about designs of busbar systems for this specific purpose, which as yet are in a comparatively preliminary state of development.

As it will be appreciated, a matter of this type can be highly controversial. But limited information is at least more than most industrial plant engineers or electrical contractors have available to them at present, even if subject to debate. So for planning an adequate continuous distribution system of enclosed busbar for feeding resistance welding machines, consider these factors—

1. The more common types of resistance welders to be considered as loads are flash, butt, projection, spot, portable and seam.

2. The common characteristic of welding machines is that they are provided with a transformer for reducing primary voltage through a secondary winding to electrode voltages—usually 20 volts or less. This transformation produces high current values at the secondary electrodes. The magnitude of these secondary currents are affected by the type of weld, shape of material being welded, duty cycle, and the like.

3. Design of equipment materially affects the amount of current which may be drawn from the primary source of supply. The current demand of a welder is expressed in kilovolt-amperes and refers to the instantaneous values of current and voltage obtained from oscillograph recordings. These instantaneous values of kva. may range from one to six times the nominal rating. The kva. demand upon a welder transformer when magnetic material is being welded is substantially less than the short circuit output of the transformer, due to impedance of material between the electrodes.

4. Power factor is a ratio of the resistance to the impedance of the welding equipment and is also equal to the kilowatt demand divided by kilovolt-ampere demand.

5. The approximate power factor of a welding machine should be known when calculating voltage regulation of the busbar distribution system. It would be better if the actual kilovolt-amperes demand by each welder were known, although calculation based on average power factor data permits reasonably accurate results.

6. Test data indicates that for flash, butt, spot and projection welders, the following power factors may be used for estimating purposes:

50 kva. ratings and above—30 per cent
10 to 50 kva. ratings—10 per cent
Under 10 kva. ratings—60 per cent

7. It is usually advisable that large welding machine installations be supplied with 440-volt primary voltage since the primary current demand is inversely proportional to the primary voltage, other factors being equal. The use of this higher voltage, in preference to 250, assists in keeping voltage drop to a minimum. The important consideration in welder busbar systems and supply transformer designs is voltage drop, not current-carrying capacity, because of the extremely low duty cycle of most welding operations. The design of the distribution system and the rating of supply transformers, therefore, should be such that the maximum dip in voltage, at any welder on the system, will not be in excess of 10 per cent of the line voltage. Tests on welder busbar distribution systems designed accordingly have indicated that *good welds* are obtained within this 10 per cent limitation of voltage fluctuation.

[Continued on Page 48]

Cleared for ACTION

Rochester mobilizes supplies and manpower for emergency electrical repairs if air raids come.

By E. J. Kramer

PLAN COMMITTEE *prepares a preliminary list of cooperating concerns and delegates special responsibilities. (Left to right) Ivar Lundgaard, R. G. & E. Co.; Ed Kramer, Electric Association; Ted Benz, Industrial Electric Co.; E. T. Alling, R. G. & Co.*

CONTRACTORS *Ed Vanderlinde (above) and Ted Benz work with IBEW Local 86 to select specialists for all kinds of emergencies. Mechanics respond day or night. Key men report to headquarters, leave theater calls like doctors.*

IF and when major sabotage or air raids strike industrial Rochester in busy Upstate New York an emergency electrical organization will act at fire department speed. Probably the first organization of its kind in the country, the Rochester Electrical Industry Emergency Organization provides for instant mobilization of the electrical industry in the event of a war borne emergency. Its sole purpose is to function swiftly to restore electrical service to industrial plants serving essential war needs.

The project is especially significant for the 100 percent cooperation pledged by every local group. Protocol and cautious procedure are non-existent. It is a shirt sleeve job being handled with a fine disregard for personal kudos and completely lacking in red tape.

In effect, an explosion disrupting electric service and wiring at any key industrial plant will "alert" a large group of electrical men for immediate action. On call, crews of workmen will be dispatched to the job, wholesalers will open stock rooms and hold delivery trucks and drivers in readiness, contractors and superintendents will converge upon the job with tools and equipment. Utility crews will tackle the

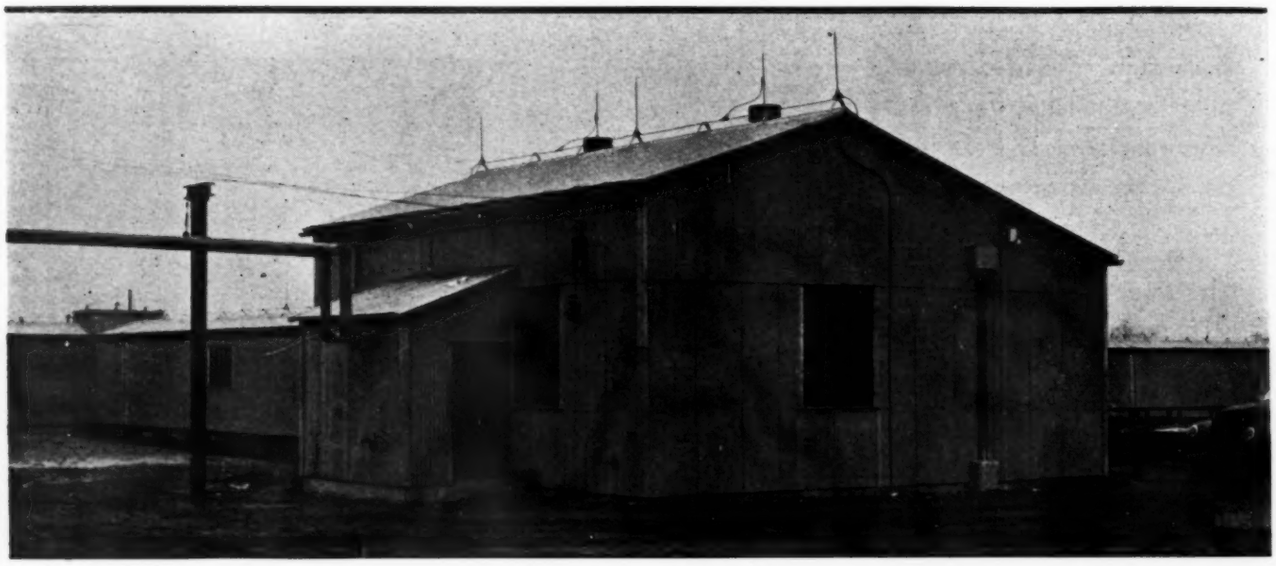
[Continued on Page 77]

MOTOR REPAIR *and replacement in emergency will be handled by experts from industrial service shops. Coordination is under direction of Ray Hornbeck, T. H. Green Electric Co.*

JOBBER *Jack Whitford, Requa Electric Supply Co., examines stock for items that can be listed for emergency use. Items normally available are not specially recorded. Stock lists are available when emergency strikes.*

MATERIAL SUPPLY *and access to stores are arranged by Carl Maier, General Electric Supply Co. Executives and employees with keys to stock rooms are on call 24 hours a day for immediate action.*

LIGHTNING



Lightning is a powerfully destructive force. But, if properly controlled, it can be tamed. Here are some typical precautions taken in our ordnance plants. Many of the ideas are applicable to industry in general.

LIGHTNING protection is a subject we usually associate with a rod and length of wire fastened to a farm house, barn or church steeple. But as for industry—well, lightning protection systems never represented a sizable portion of any electrical job. In fact, it might be safe to venture that few electrical contractors ever had to install a system—that is, until Uncle Sam's army ordnance department began construction in a big way.

Today, more than ever before, protection is utmost in the minds of plant designers, builders and management. Production must be maintained at all costs. Life and property must be safeguarded against accident, sabotage and even Nature's angry arm—lightning.

The Army Ordnance Department is taking no chances. They are equipping their plants with extensive, yet simple, systems for the harmless discharge of lightning surges to ground.

The General System

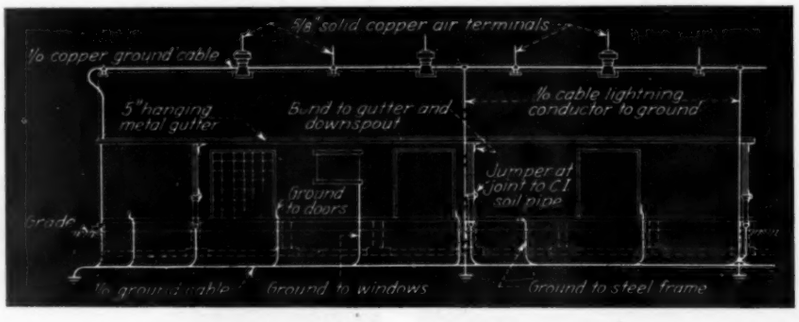
The theory of lightning protection is to conduct the discharge to ground as rapidly as possible. Hence all buildings, above and underground are equipped with a system of aerial lightning rods spaced on 20-ft. centers and mounted along the highest ridge of the building. These aerials are extended about three feet above the highest building point and tied together with a No. 1/0 stranded bare copper cable which, in turn, is grounded at regular intervals through copper grounding conductors to suitable buried or driven ground points. The number of down conductors depends upon the length of the building. Buildings up to 110-feet in length have at least two down conductors with one additional one for every 50-ft. increase in length.

The number of ground points are a function of the size of the building and the condition of the adjacent soil. In some buildings as few as four ground rods are sufficient. In others numerous rods with an interconnecting ring of ground conductor surrounding the structure are necessary. Multiple grounds are sometimes necessary to obtain the proper resistance values. Ground conductors are mounted on the exterior of the buildings. Conductors ringing a building are buried in 2-ft. deep trenches and the ground rods are driven so their tops are 2-feet below grade.

Low Resistance Path

There are two important factors in installing lightning protection systems. One is the shaping of the conductors and fittings. All turns must be sweep bends.

FIGURE 1. AERIAL RODS *along roof ridge of the above-ground buildings tie in with the buried ground rods through down conductors. All metal objects, reinforcing mesh, steel, window and door frames, metal siding and rain spouts are bonded to the copper conductor ringing the building. This, in turn, ties in with buried ground rods.*


5/8" solid copper air terminals
1/0 copper ground cable
5" hanging metal gutter
Bond to gutter and downspout
1/0 cable lightning conductor to ground
Jumper at joint to CI soil pipe
Ground to doors
Grade
1/0 ground cable
Ground to windows
Ground to steel frame

PROTECTION

By August Eckel

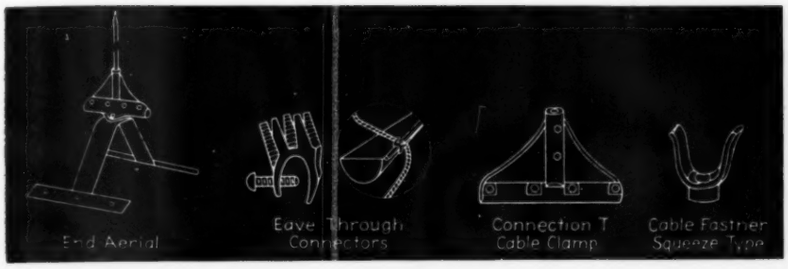


FIGURE 2. TYPICAL FITTINGS *that are used in lighting protection systems include ventilator, end and supplementary aerials, special fasteners, clamps, ground plates and connectors and the typical ground rod and cable.*

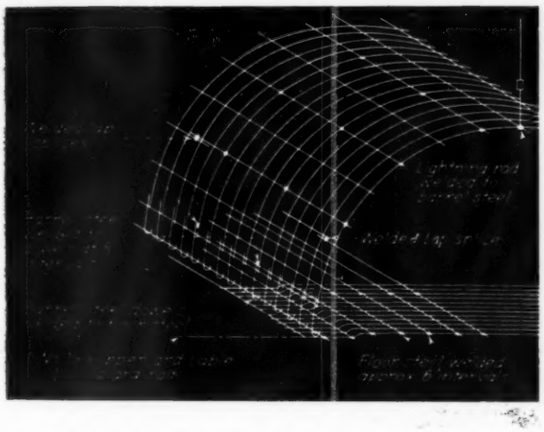


FIGURE 3. STEEL REINFORCING-CAGE *for the standard igloo is now welded at intervals to form an electrically continuous path for current conduction. Lightning aerials are fastened to this cage which is connected to ground conductors and rods.*

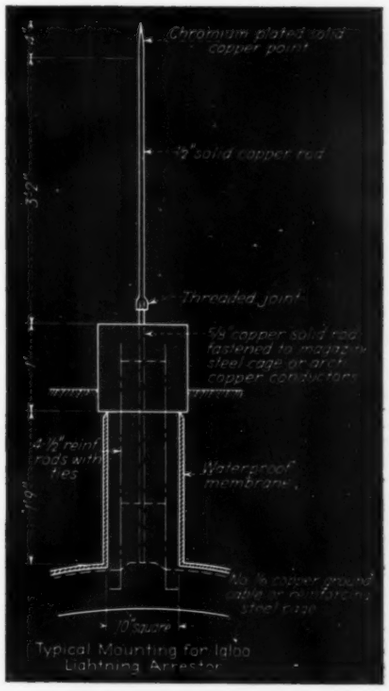


FIGURE 4. UNDERGROUND IGLOOS *are protected against lightning. Aerial rods in specially constructed pedestals tie in with arch conductors or welded steel reinforcing which, in turn, is connected to driven ground rods. All metal in the igloo is tied in with the grounding conductors. One ground rod at each corner is sufficient.*

No right angle bends or short, sharp offsets are permitted. All cast fittings have rounded edges and right angle joints are supplemented with a web forming a sweeping curve. All this precaution is taken to assure that, once a rod picks up a lightning discharge, the conductors will carry it to ground quickly, without any danger of jumping arcs at joints, bends or offsets. A smooth low resistance path is necessary.

Since lightning discharges must be grounded quickly, the resistance of the grounding system is important. The lower it is, the better, for that makes it clear sailing for the grounded discharge. There is no desire to have it linger on its journey.

The critical resistance value is 25 ohms. All portions of a grounding system, tested separately must read 25 ohms or less. The entire system when interconnected must not exceed this value. If this value is exceeded, multiple ground rods are driven, or a counter-poise system tying in all rods around a building is installed.

If ground conditions are tough, giving high resistance readings, or preventing the use of driven grounds, the area adjacent to the perimeter of the building is checked until suitable soil is found. Down conductors are then extended to this area. If driven ground rods cannot be used, copper and charcoal ground plates can be buried in the ground to serve the same purpose.

No splices in grounding connections are permitted. All joints and ties are made with approved solderless connectors. Grounding resistance tests conducted by the Underwriters Laboratories revealed values ranging from 25 ohms down to zero, attesting to the efficiency of the system installed. All materials used are inspected by the Underwriters Laboratories at the factory before shipment to the job. Inspection of the installation is under the supervision of the constructing quartermaster, architects, engineers, contractors and in some cases the operators of the plants. In addition, Underwriters Laboratories makes spot inspections and tests on the job during all construction stages. Reports of the inspections and copies of the resistance readings obtained are filed by the Underwriters in the C. Q. M. office.

All metal objects or parts of the interior and exterior of buildings, except water pipes, steam pipes and electrical conduits, must be bonded to the lightning protection system. This includes all windows, doors, reinforcing and structural steel, sheet metal objects, pipe inserts for vacuum system and all other metal objects. Inserts for the expected systems mentioned above are bonded to the pipes going through them.

Metal gutters, rainspouts and cast iron soil pipes are all bonded together and tied in with the ground cable. Door hinges, frames, etc., are also carefully bonded.

To discharge any static electricity that might be generated, all metal table legs and other objects in the buildings are bonded by copper cable to the reinforcing mesh in the floor which, in turn, is tied in to the ground cables. Special conducting flooring is also installed in the buildings and employees wear special shoes.

The underground buildings, or storage igloos, are semi-circular in cross section and when finished are covered

[Continued on Page 112]

STREAMLINED

Shop planning at Scherer Electric

1 ASSEMBLY FLOOR *along the north side of the shop. The loading door and office is beyond. A monorail and underslung crane system makes loading and handling of equipment quick and safe.*

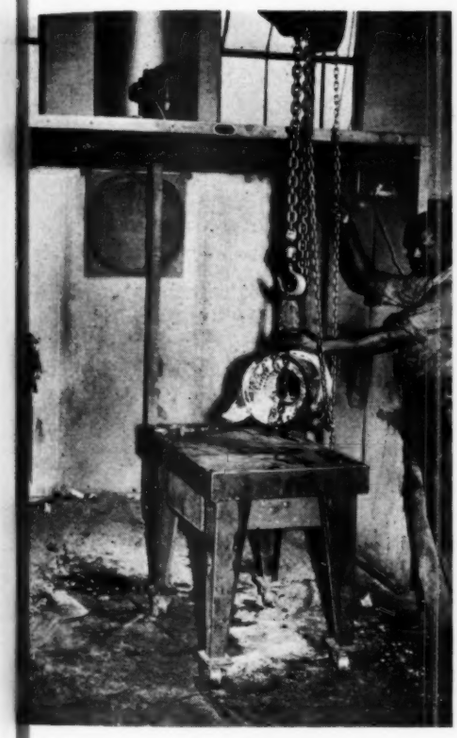
2 PRECISION MACHINE *work is handled along the fluorescent lighted west side of the shop where individually motored machines, screw press and welding equipment produce bearings, shafts, commutator turning and undercutting and welding of broken parts. Convenient bucks for armatures and rotors give protection while awaiting machine work.*

3 WINDING DEPARTMENT *along the south side with individual fluorescent lighted work benches provide modern and efficient working conditions. The coil making department is at the left.*

4 ELECTRICAL TESTING BOARD *bordering the assembly floor is dead front. Its instruments are replicas of the same four instruments used in the portable Weston analyzer for outside testing. A special transformer provides all voltages from low impedance to 550 volt service testing, also 2300 volt.*

for INDUSTRIAL SERVICE

Company in Indianapolis speeds repairs with assembly line methods.



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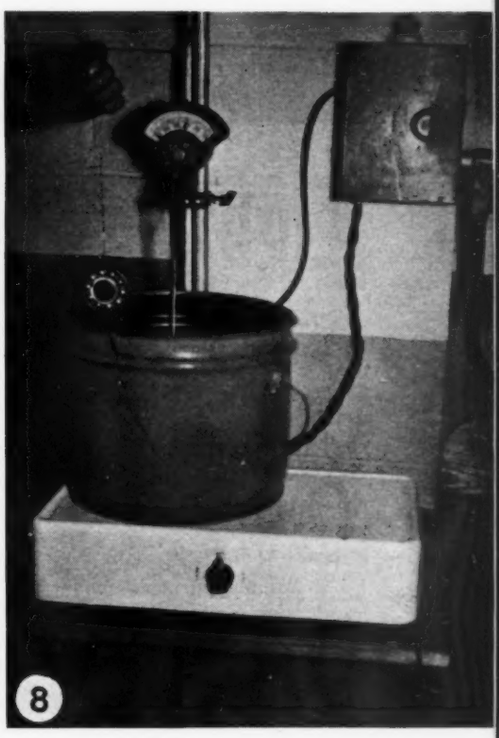


8

5 AUTOMATIC TEMPERATURE *controlled specially designed gas heated burn-out oven heats the entire stator uniformly. The maximum temperature is limited to 600 degrees by the automatic Brown pyrometer instrument shown at the left. All combustible material is reduced to ashes. Cooled to 200 degrees in this insulated oven the stator is then removed for stripping.*

6 AFTER BURN-OUT, *the stator, placed on a portable steel table in the adjoining dust booth, has the ash removed quickly by compressed air. With all insulation removed, the clean copper winding can be accurately checked for winding data. Then the loosened copper is easily and quickly removed leaving a stator as perfect as when it left the factory. This stripping method provides a clean and dry stator ready to receive a new winding.*

7 MOTOR PARTS *are thoroughly cleaned in a specially designed twin-unit cleaner. One side cleans and the other side rinses. Stoddard solvent sent through hose nozzles from motored pumps below is the safe cleaning fluid. It drains back through filter beds to reservoirs below. Hood and exhaust fan remove vapors.*

8 OIL HEATING *bath for ball bearings to be shrunk onto shafts is electrically heated by a hot plate with automatic temperature control.*

9 ELECTRIC CONTROL SERVICE *shop with specially trained workers repairs switchboards and control panels for modern industry's machine tools.*

9

● COMFORTABLE LIGHTING *of high level intensities and even distribution keeps the girl at the typewriter and the man behind the ledger working at top efficiency in this plant office. Eye fatigue is now an unknown quantity.*

Lighting a Factory Office

Good lighting is equally as important in the office as in the manufacturing area. Here's how a Chicago firm stepped up its office illumination to increase efficiency.

THE management of the Pheoll Manufacturing Company, bolt, nut, and screw manufacturers of Chicago, realize that peak production is dependent upon modern high level illumination, whether it be in the manufacturing area or in the office of the plant. Paper work can be just as exacting as work on a screw machine. Orders, invoices, bills, stock and production records, payrolls and the hundreds of other "office tasks" tax the employee's eyes to capacity. And under mediocre lighting it isn't long before eye fatigue takes its toll and efficiency lags.

So the Pheoll management approached Roy Hyre, president of Hyre Electric Co., Chicago electrical contractors, and demanded a first class lighting job in the plant office. Their existing lighting was of the indirect type, using 500 and 750-watt incandescent lamps. With the acoustical tile ceiling they had, this system was giving them what was considered "tops" when it was installed about six years ago—an intensity of about 10 foot-candles. But with the present increased standards and defense work rolling in, it just wasn't enough.

Research Units Chosen

Hyre Electric Co., proceeded to design and install a fluorescent installation that would guarantee a maintained intensity of at least 50 foot-candles on the working plane. Continuous row fluorescent lighting using the new "Research" Solar No. 5548 unit was chosen. Individual units contain four 4-ft. fluorescent lamps each and are mounted end-to-end in rows spaced on 12-foot centers. These "lines of light" extend the length of the general office area. The number and spacing of the units in the individual offices depend upon the size of the room.

A total of 168 four-foot, four-lamp fixtures were installed as follows: two rows, each 140 ft. long; two rows, each 88-ft. long and two rows, each 28-ft. long. The rest of the fixtures were apportioned between individual offices and smaller areas. The fixtures were mounted direct to the suspended accoustical tile ceiling at an 11½ ft. mounting height. White 3500 deg. lamps were used throughout the area.

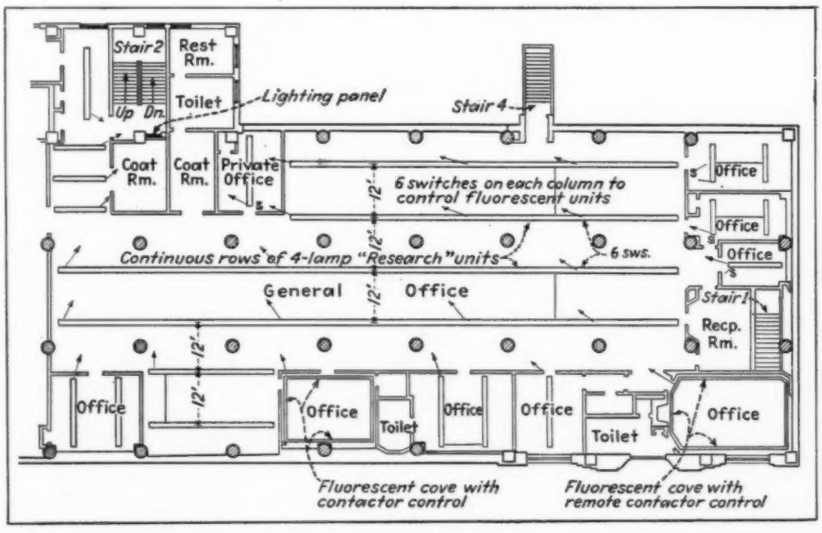
Easy Installation

The installation of this particular type of unit was quite simple. It resolved itself into four steps.

1. Lining up and mounting the metal supporting pieces to the accoustical ceiling.
2. Sliding the already wired skeleton fixture on the studs of the supports.
3. Sliding other sections into place and threading feed wires through the end openings and finally connecting to ceiling outlet.
4. Installing lamps and glass panels.

So far as circuiting was concerned, there was no trouble. The original installation in the building had been designed for a maximum of one volt drop, hence there was plenty of No. 2, No. 10 and No. 8 wires. Conduits had plenty of extra capacity. Originally there

[Continued on page 111]

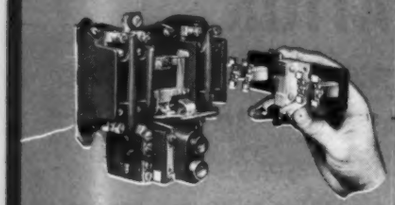


CONTINUOUS ROWS *of fixtures mounted end to end are spotted on 12-ft. centers in the general office area. Flexible switching and remote contactor control of cove lighting are features of the installation.*

MISTER, we keep 'em *Clean!*

Keeping things shipshape is an unending job in the navy . . . for dust settles on horizontal surfaces everywhere whether these surfaces are parts of a boat far at sea or parts inside motor control in any factory.

Because dust *is* found in even the most unexpected places, it is not surprising to find it *inside* Motor Control equipment in *any* busy factory. Cutler-Hammer engineers recognized this . . . and they also knew that dusty, dirty contacts meant trouble . . . so they designed their famous VERTICAL contact Motor Control. *Vertical* contacts simply can't collect dust and dirt. They *stay* clean to work better and last longer. Such Motor Control that needs less attention and sets records for dependable performance in these days and nights of continuous high-speed production contributes not only to industrial efficiency but directly to national security. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto.



Cutler-Hammer Vertical Contacts are the mark of better Motor Control, another extra dividend on Cutler-Hammer's unequalled specialized experience and decades of Motor Control leadership.

CUTLER-HAMMER
MOTOR CONTROL
C-H

1892-1942 50th ANNIVERSARY

Dust Safe VERTICAL *Contacts*

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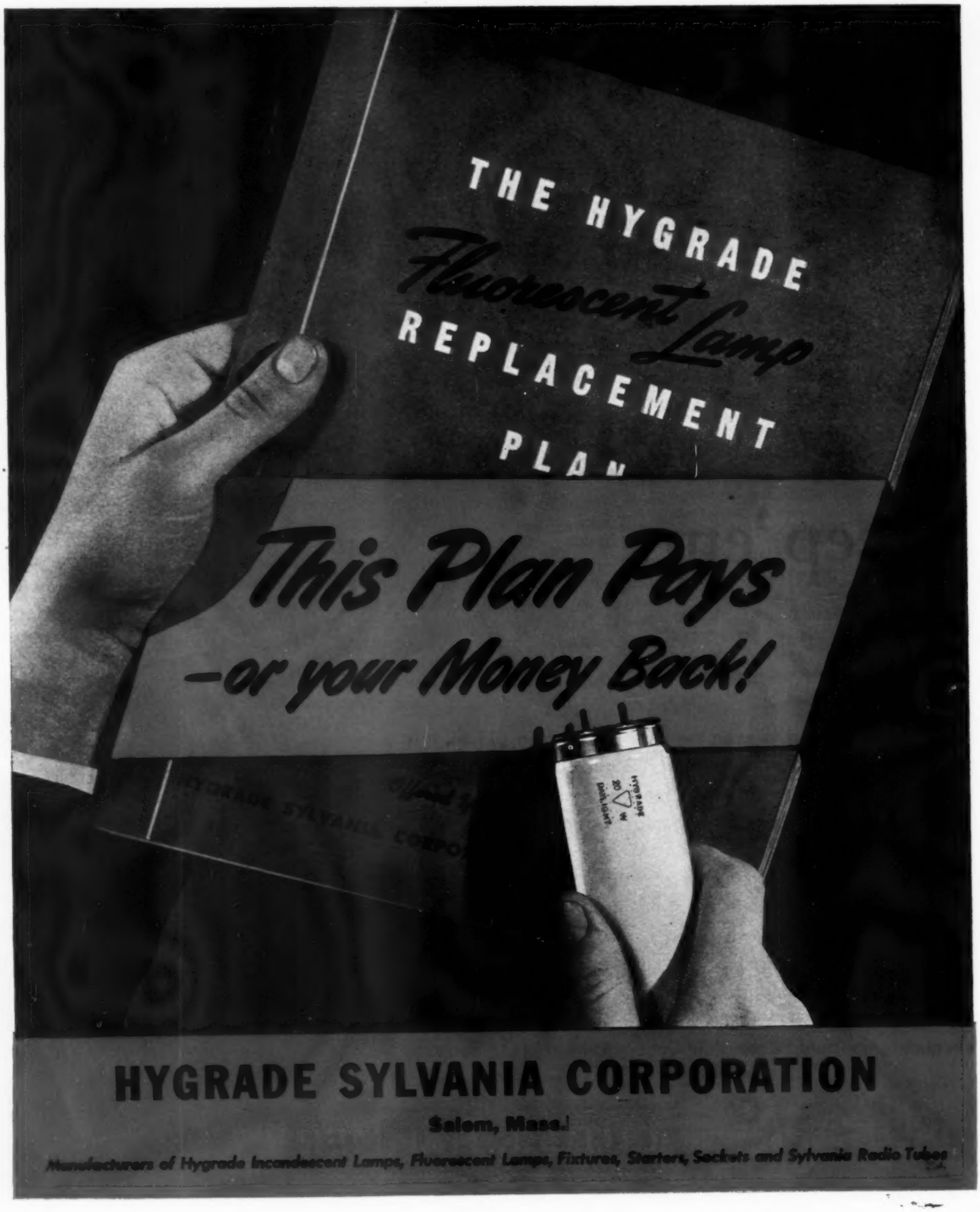
GET IN ON THE



HYGRADE SYLVANIA CORPORATION

Salem, Mass.

Manufacturers of Hygrade Incandescent Lamps, Fluorescent Lamps, Fixtures, Starters, Sockets and Sylvania Radio Tubes

GROUND FLOOR!

ACT QUICKLY and get your share of the huge new market in fluorescent lamp replacements!

IT'S a market that didn't exist four years ago. It's about five times as large as it was even two years ago. And it's a market that's right on your own doorstep—an opportunity to add a fresh source of profit at a time when you need it most!

You'll find it wrapped up in The Hygrade Fluorescent Lamp Replacement Plan!

Here's how it works:

Grab your slice of a $25,000,000 market!

Take a look around you. All through your neighborhood you'll see fluorescent users—stores, commercial establishments of every kind.

Sooner or later they'll *need new lamps.* Need them *regularly.*

And they'll have to get them from somebody.

The Hygrade Plan proposes to make *you* that somebody. It aims to make you Fluorescent Man No. 1 in your locality.

For an advance of *less than fifty dollars* it supplies you with an initial assortment of Hygrade lamps—along with Mirastat starters and a special lamp and starter checker.

It gives you a big supply of punchy sales helps designed to bring customers to your door.

It provides for selective distribution that protects you in your market.

It gives you all the technical advice and assistance you'll need to enter this new field.

You can't lose!

And best of all, you get them *without the slightest risk!* Try this plan for a *full six months*—and if you're not thoroughly satisfied, *you can toss every unsold item back at us*—and we'll pay you full cost price.

These are the cold facts on one of the hottest deals ever offered the electrical trade. You can't lose. Turn out the profits or turn in the lamps! If you are sure you can do a job, fill in the coupon below and we'll send you full details at once.

FIVE "SURE-BET" FEATURES

of The Hygrade Lamp Replacement Plan

1. Selective distribution which protects your profit and assures you an adequate market.
2. A completely packaged lamp sales campaign that's carefully developed to bring the business to you.
3. Booklets, folders and other sales helps—including window insignia that identifies you as Fluorescent Headquarters.
4. Complete technical advice and assistance—including equipment—designed to make you adept in every phase of sales and service.
5. The finest fluorescent lamps made—lamps that give more light; last longer; remain "bright to the last inch."

HYGRADE SYLVANIA CORPORATION, Salem, Mass.

Please send me full particulars on the new Hygrade Lamp Replacement Plan.

*Name*_____

*Firm*_____

*Address*_____

_____

Editorials

Reinspection for Defense

Systematic reinspection of electrical systems has been stifled for years by apparent lack of manpower. Now, that manpower will be available. As priorities gradually reduce commercial and residential building to the vanishing point, inspectors' duties in these fields will decline proportionately. These men can now be used for reinspection service.

Thousands of plants throughout the country are changing over to war production on a 24-hour per day, seven day per week basis. Production snags due to overloaded and faulty electrical wiring are disastrous to our war program. Reinspection will reveal such weakness before it is too late.

Some inspection bureaus are already working on such a plan. Others should follow. Here is a service that inspection authorities can voluntarily offer American industrial and commercial enterprise. Here is an opportunity for the electrical inspector to broaden his service to our country.

We guard our plants and buildings against enemy saboteurs. Let's guard against that invisible and unpredictable saboteur—defective wiring. Let's reinspect for defense.

Didn't Like It

Away from the defense industry centers, especially in the interior towns, independent spirited electrical contractors were inclined to pay no attention to "all this OPM business" and now begin to find themselves without materials to finish up jobs they never should have undertaken.

Priority business was seemingly complicated, they had never done business that way, they may not have liked the administration, or they figured they could wangle enough material from the supply jobber, and they took the job offered to them, sometimes by a good customer of long standing, sometimes by one they had long angled to get. So they did not require a priority number, signed up, started out on their own materials and now are up against it to complete the job. The inspector is wangled to permit changes or substitutions, the wholesaler is put on the spot, the OPM and WPB cussed.

To win this war everybody must keep in line, get in step, take orders, assume responsibility, just as the soldier is expected to do. It's hell to have a juicy job dangled in front of you and not be able to take it, often on your own terms. But unless the customer has the right to build in these times, and his priority rating certifies it, the contractor is committing commercial hari-kari (suicide in Jap) to have any part in it. That is, unless he has a wide open escape clause in his contract.

Roll Out the Barrel

The president of a middle west electrical contractors organization recently offered to supply each member of the group with a barrel to receive scrap metals.

A barrel of scrap may not seem like much. But, multiply this by the thousands of electrical contractors' shops, motor repair shops, plant maintenance shops and construction jobs throughout the country and you will have a sizable chunk of scrap.

Let's roll out our barrel and start the ball a-rollin. Let's do our bit, however small it may be.

Listing Restrictions

The latest price sheet of a wiring device manufacturer carries on its front page a legend which, when applied to items listed in the catalog, designates whether, (a) manufacture has been discontinued, (b) item bears specific priorities for governmental departments, (c) full production of item is for orders carrying priorities ratings, or (d) manufacture is suspended for the duration.

Here, at last, is the story of what we can and cannot have. But, in a way, the contractor should welcome such an approach. At least now he knows what the manufacturer has available and what he can hope to get. It simplifies ordering for him. It is hoped other manufacturers will follow suit.

And, who knows, after it is over, we may emerge with the standardization we have so long sought. Discontinued and suspended items will remain forgotten and we shall have streamlined, standard lines of first-class electrical equipment.

More Rehabilitation

There is important work for the small electrical contractor in rehabilitation and remodeling work for defense housing.

C. F. Sweet, Chicago Defense Housing Coordinator, in pointing out the critical need for remodeled homes for defense workers, indicated that rehabilitation carried the highest priority rating of all defense housing.

The need for speed is evident as defense workers are pouring into completed plants all over the country. Here's a chance for the house wiring contractor to do a job for himself and his country.

Back to the Books

The critical shortage of steel is eating its way into metallic wiring systems, especially in residential and defense house wiring. Metal clad wiring systems for other than absolutely essential occupancies may be shut off. We can still use approved knob and tube and non-metallic systems. Non-metal-

lic sheath cable is already replacing armored cable in a number of defense housing projects.

Many electrical contractors and wiremen, especially the newest members of the electrical fraternity, may be unfamiliar with these systems. Installation rules, regulations and details are different. If we want to figure and do this type of work we've got to know how it's done.

It may be a good idea to crack the books again to fortify ourselves with knowledge as well as skill. In these days we must be ready to handle all kinds of wiring. So let's review and acquaint ourselves with available substitute systems. It's this type of all-out effort that will keep us on top.

Electric Tool Repairs

Motor repair shops, not equipped to handle large work, might well set up to handle small work on a large scale —especially electric tools.

Hundreds of thousands of grinders, drills, saws, etc. are being used by industry every day—some on a 24-hour per day, seven day per week basis. They've got to go some time. And when they do they can't be easily replaced. New tools are mighty scarce.

Here's a chance for enterprising motor shops to lend a hand by setting up to repair these items. It is an essential job for these times.

Subcontracting for Motor Shops

The "bits and pieces" subcontracting program of W.P.B. calls for the effective utilization of every available machine tool for some kind of war or essential civilian production. But more than that, it is hoped that these machines can be used continuously on a 24-hour schedule.

Many of our industrial service shops have a line up of splendid machine tools for the mechanical work of motor and controller repair. Much of this equipment is suitable for excellent standards of precision. Several prominent shops are already handling the manufacture of parts under subcontracts. There is a possibility of others coming in on a night shift operation, turning over the mechanical repairs department to a night crew for processing metal parts for local prime contractors. The daily switch takes some careful planning and ingenuity but offers no serious obstacle to normal shop operation during the day.

Back Talk

More Conservation

To the Editor—"While reading the article Saving Metals in Wiring" in the February, 1942, issue of *Electrical Contracting*, I wondered whether you would be interested in the following additional steps which I believe would assist in saving materials, including rubber as well as metals.

"Item 1: The use of bare neutrals much more extensively than the Code allows.

"Item 2: The use of conduit return for branch circuit wiring in fireproof construction. This type of installation could definitely conserve materials but probably would not result in a labor saving since the electricians would have to take a little more time to really tighten the connectors and joints and probably to install jumpers in outlet boxes.

"Item 3: Do not eliminate Code grade rubber insulation as a stock item in the large wire sizes. I understand that the newest simplified practice recommendation on wire sizes will provide only for Type RH insulation on large sizes. In those cases where current carrying capacity is the limiting factor, the use of RH insulation will save metals, but there are many installations where voltage drop is the limiting factor; in this case, especially on installations which are only for the duration of the emergency, the use of Code grade insulation would effect a saving in rubber.

"Item 4: The use of networks and loop circuits in some installations can effect material savings.

"Item 5: The use of 3-wire or 4-wire circuits wherever possible instead of 2-wire or 3-wire circuits increases the ratio of active conductors to neutral conductors.

"The conservation methods mentioned in the article are all to the point; their use, together with accurate design and engineering, will be very beneficial in themselves, but I believe that we could safely go much farther."

Royce E. Johnson, Director
Electrical Standards Laboratory
University of Wisconsin
Madison, Wisconsin

There are so many suggestions today of the type Mr. Johnson proposes in items 1 and 2, that a word of caution is in order. Under the urgent pressure for economy in rubber we may see some bare neutral jobs and even, perhaps, the use of conduit neutrals. And further economies may eventually be justified. For this is war. But right now the electrical safety of a war industry plant ranks far higher in importance than economies in wiring materials, and we are constantly in danger of considering the conservation problem in the narrow terms of our own industry.

It has often been contended that our safety standards are too high and that the Code could be extensively modified with little added risk. But if we accept the premise that structures now being wired cannot be replaced for the duration, electrical safety takes on new significance and importance. If compromise with Code standards must come, let it be made first around those rules which contribute principally to permanence and future safety. Mr. Johnson's Item 3 is a suggestion of this type.

The advantages of conservation by the use of networks and 3- and 4-wire circuits are evident.

A Challenge

To the Editor—"The type of articles that you have placed in your current issues of *Electrical Contracting* is constructive. There has been a great deal said about blackout lighting but very little commercial information made available which was practical and usable by the layman. Your articles are well prepared and we believe they will be helpful.

"A most important point in this coming year in connection with lighting is the great opportunity which we have for increasing production and eliminating defective war goods by the use of high levels of lighting. There is a real challenge to the industry to put into operation a lighting development plan which has been considered for years. We have definite proof that production, volume and efficiency could be increased at least 10 per cent in the majority of industries with the proper increase of lighting levels.

"Those concerned with our war effort cannot help but be interested in plans which would thus increase the output of our war industries available buildings and equipment and with only moderate investments in lighting equipment."

R. C. Kinney
Graybar Electric Company, Inc.
New York, N. Y.

The importance of good lighting in our war industries cannot be too strongly emphasized. In times like these there is a temptation to let old systems remain, to get by with existing lighting because materials are scarce and priorities complicated. This is false economy. We all have an urgent responsibility to give war production the best lighting we know how to provide. And it is up to electrical men who have the facts and the proofs of what good lighting can do for production to "sell" both industrial management and government. If every contractor and industrial electrical department would study their conversion jobs with a critical eye for the lighting to be provided they would be doing a mighty important job for Uncle Sam.

Blackout Control

To the Editor—"I have been actively interested in the Civilian Defense setup in Buffalo, in connection with the Air Raid Warden organization. Under the circumstances, your article "On the Alert" in January was particularly interesting to me.

"One problem needing an answer is that of the small store which normally locks its doors at 5:30 or 6 o'clock, has show-window lights and possibly a sign controlled by a time switch but with no one in attendance during the evening. When trial blackouts are announced before, it is, of course, easy for the store manager to see to it that the building is blacked out that particular evening. Unless some device, however, is found whereby the lights can be turned off quickly and from the outside or through some other agency in the case of unannounced blackouts, we face the probability that stores of this type will be blacked out continuously during the evening hours if pressure on the Civilian Defense organization becomes heavier. One or two unannounced trial blackouts which find a number of these stores lighted, due to lack of proper precautions, will result in a crack-down by the authorities, particularly in cities between the Eastern Seaboard and the Great Lakes.

"A similar problem confronts the poster board people. One company, for instance, has approximately 350 poster boards in this city, each controlled by a time switch. The sign company organizations are relatively small and to darken these boards quickly seems to be an impossible problem at the present time. In a few cases groups of boards have been rewired and a control switch placed within reach of the ground. This is so arranged that when it operates a deliberately planned short circuit causes a fuse to blow; this prevents deliberate tampering more than once, but necessitates a service call after every operation.

"If *Electrical Contracting* can find good answers to the above two problems, it will do the store owners and managers and the electrical industry a service."

E. A. Brand
Buffalo Niagara and Eastern Power Corp.
Buffalo, N. Y.

The probability that civilian defense rules may crack down on unattended lighted show windows and electric signs is imminent. The pressure, so far, has not been great because blackout tests after ample warning have proved successful. A few tests without warning may show our preparations are too inadequate to risk a real emergency.

Actually, the need for accessible emergency switching control is a police problem. There is absolutely no doubt that in a real emergency unattended lighting will be extinguished by irate citizens. No one wants that kind of emergency control.

WIRING Methods

PRE-CAST PANEL SUPPORTS

Angle iron, cast in the concrete floor slab, is used by the Hixon Electric Co., electrical contractors and engineers of Boston, Mass., to support flush type panelboard cabinets which are mounted prior to the construction of the interior walls and partitions.

Four pieces of 1¼-inch angle iron form the base support. The rear pieces

***RIGID SUPPORT** for panelboard cabinets keeps them from shifting when the interior wall is built around them. The method saves non-productive labor and assures well aligned panelboards.*

at each end of the cabinet are bent forward and bolted to the front uprights to form a triangular supporting frame. When cabinets are mounted above each other, angle iron extensions are bolted to the lower cabinets to accommodate the upper ones. A horizontal support from the rough wall to the top cabinet keeps the entire assembly rigid. And it eliminates the necessity for a mechanic to stand watch when the walls are built.

In the particular installation shown in the photograph, the cabinets were mounted 2-inches behind the finished wall line. This was done to allow for covering the cabinet doors with the same type of material used for the interior finish of the room. In this case it was an asbestos wallboard.

A CORRECTION

In this department we published in the January issue an item entitled "Power Factor Chart". Unfortunately there was an error in the formula for the wattmeter reading. The correct formula is

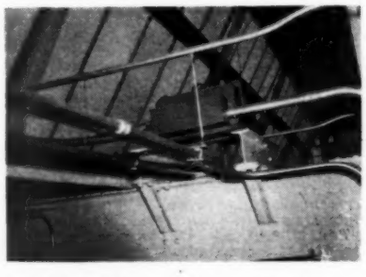
Watts $= \sqrt{3} \times E \times I \times P.F.$

We regret that this type error appeared.

TRUSS MOUNTED TRANSFORMERS

Air cooled transformers serving the lighting distribution system at the plant of the George Gorton Machine Co., Racine, Wisconsin, were mounted in out-of-the-way locations wherever possible.

One of the most out of the way, yet fairly accessible, places was up in the roof trusses. Here they were mounted on two I-beam supports bolted to the upper side of the roof girders. Elevating them slightly above the girder thus provides space for other conduits to go through underneath and also increases the air circulation space around the unit.



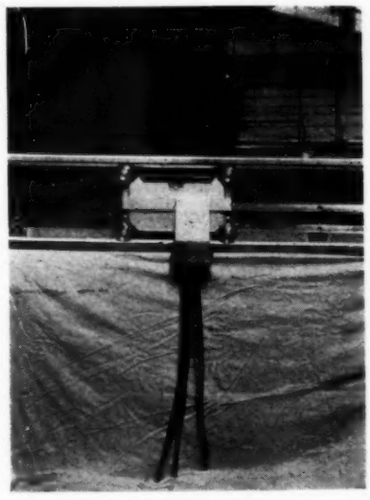
***TRUSS AREA** provides out of the way, yet accessible mounting for this 25 kva, air cooled lighting transformer. Primary is connected to bus duct power system. Secondary feeds a column mounted lighting panel.*

The unit shown in the accompanying photograph is fed by a flexible conduit connection to a 220 volt, 3-phase bus duct power distribution system and feeds a 110/220 volt lighting panel on its secondary side.

Similar transformer arrangements can be used throughout a plant for special voltage requirements or to replace or augment low voltage feeder systems.

CRANEWAY PROTECTION

A method of inclosing trolley wires for outdoor or indoor craneways has provided the electrical contractors, Kuchel & Sievers of San Francisco, with an opportunity to install considerable work in San Francisco shipyards. Exposed trolley wires on craneways have been the source of more industrial accidents than necessary, each disrupting the morale of employees and slowing down production. On defense industry, these are serious hazards.



***EXPOSED SIDE** of the trolley collector. Upper wheels are on spring adjustment. Lower wheels are locked in place by the set screw, since they carry the weight while upper wheels take up adjustments for inequalities of the rails.*

Following experiments with a type of covered trolley closures in a large industrial plant in Oakland two years ago, Charles Barkis, design engineer for Trumbull Electric Manufacturing Co. in San Francisco, expanded the application of the company's trolley duct used with portable tools in a shop for heavier duty service on craneways.

First requirement was for trolley wire carrying 200 amp. at 440 volts 3-phase. Larger sizes are being developed for up to 400 amp.

AN ELECTRICAL WHOLESALER HELPS SPEED WAR PRODUCTION

WESCO delivered all 68 items in 3 Days!

SAVED AIRFIELD 81 DAYS DELAY;

Fastest Complete Delivery From Manufacturers 12 Weeks

A West Coast airfield and cantonment construction job urgently needed 68 items made by nine different manufacturers. Delivery promises by manufacturers ranged from 1 to 12 weeks which meant losing up to 3 months valuable time. By slashing through red tape, delays and complications, the local WESCO Branch delivered all 68 items in *3 days!*

Certainly—this buyer had a priority rating permitting WESCO to make shipment. But here's the point: If this defense order had been placed directly with the nine manufacturers, it would have involved 9 orders, 9 acknowledgments, 14 invoices, 14 shipments, 14 bills of lading, 14 checks to issue.

Compare this with what WESCO provided through services of its local House—1 order, 1 acknowledgment, 3 invoices, 3 shipments, 3 bills of lading, 1 check.

This kind of intelligent service under today's stress is exactly the same as WESCO has rendered its customers for the past 20 years and will continue to give in the future. The only difference is—today it is labeled "For War"; tomorrow "For Business".

WESCO SPEEDS PRODUCTION

* An air depot got 50 floodlights from WESCO the same day order was issued, after another source had failed to meet a 15-day delivery promise.
* Shipment of 55 miles of conduit for war plant started within 24 hours after WESCO got the order. Best delivery from any other source was 5 weeks to start.

WESCO SERVES BUSINESS

* By warehousing stocks in anticipation of customers' needs.
* By furnishing informative and technical data.
* By providing trained sales and engineering personnel.

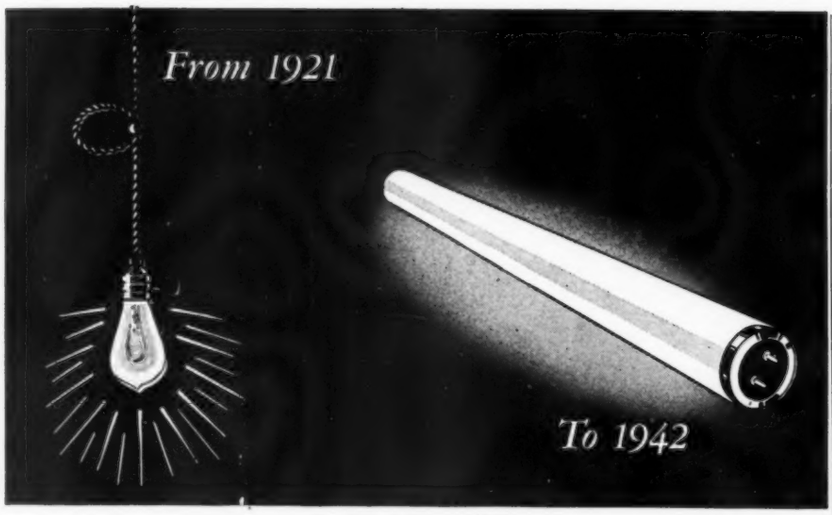
Westinghouse

ELECTRIC SUPPLY COMPANY

150 VARICK STREET · NEW YORK, N. Y.

The name that means everything in electricity

A NATIONAL DISTRIBUTING ORGANIZATION WITH 79 BRANCHES



INDUSTRIAL LIGHTING SPECIALISTS

Even in these war-busy days, a 21st birthday seems important enough to warrant a little celebration... and we have been at this lighting business now since the beginning of Warren Harding's administration, way back in the "good old" flapper-and-speakeasy days.

As specialists in the research, design and fabrication of equipment for the broad fields of industrial, commercial and flood lighting, we have developed many dependable ways to control incandescent, mercury vapor, fluorescent—*and now the new RF*—light sources to achieve maximum efficiency.

Why not put *your* lighting problems up to a specialist? Bright Light Reflector Co., Inc., 1033 Metropolitan Avenue, Brooklyn, N. Y.

Write for one or both of these Silv-A-King Lighting Guides: LG1 — Fluorescent, or LG2 — Incandescent.

Quality and dependability through two decades have linked the Silv-A-King name with such famous names-in-industry as:

AC SPARK PLUG
BETHLEHEM STEEL • BUICK
CHEVROLET • GENERAL MOTORS
FISHER BODY
INTERNATIONAL HARVESTER
JONES & LAUGHLIN STEEL
PITTSBURGH PLATE GLASS
RUPPERT BREWERY
WARD BAKING
and many others

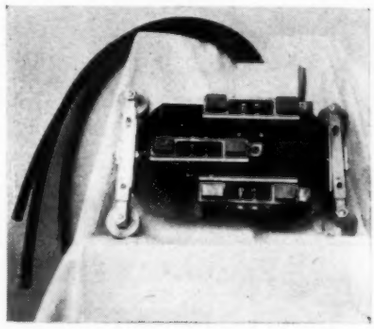
SILV-A-KING MAKES *Light* WORK FOR YOU

WIRING Methods

[FROM PAGE 32]

The trolley closure is made in 10-ft. sections of 10-gage steel in a rectangular duct with an open side. Set vertically against a column, a cover hangs over the open side to protect the buses from the weather. Copper busbar of oversize capacity is mounted on insulating bushings in such a way that the joints at the sections, being offset, provide a continuous path for the double brushes. With double brushes at least one is in good contact at all times.

Brushes are held in a special spring clamp on an assembly which runs on tapered and undercut wheels with oilless bearings. The wheels engage two angle rails welded to the edges of the housing. Spring tension on the upper



***PROTECTIVE COVER** removed, the sliding brush assembly is shown in place against the buses.*

wheels takes up inequalities in the rail while the weight is carried on the lower wheels. Adjustment nuts hold the brush holder trolley firmly in place once set.

Leads from copper graphite multiple brushes are shielded from each other by barriers of insulating material and brought through flexible connections to heavy rubber covered conductors. The leads loop below the trolley and are served to the crane motor through customary circuit protection and switching. Runs as long as 600 ft. and over operate with perfect conductivity and mechanical smoothness. Some 4,000 ft. of the trolley enclosure has been installed in one shipyard by Kuchel & Sievers Electric Works.

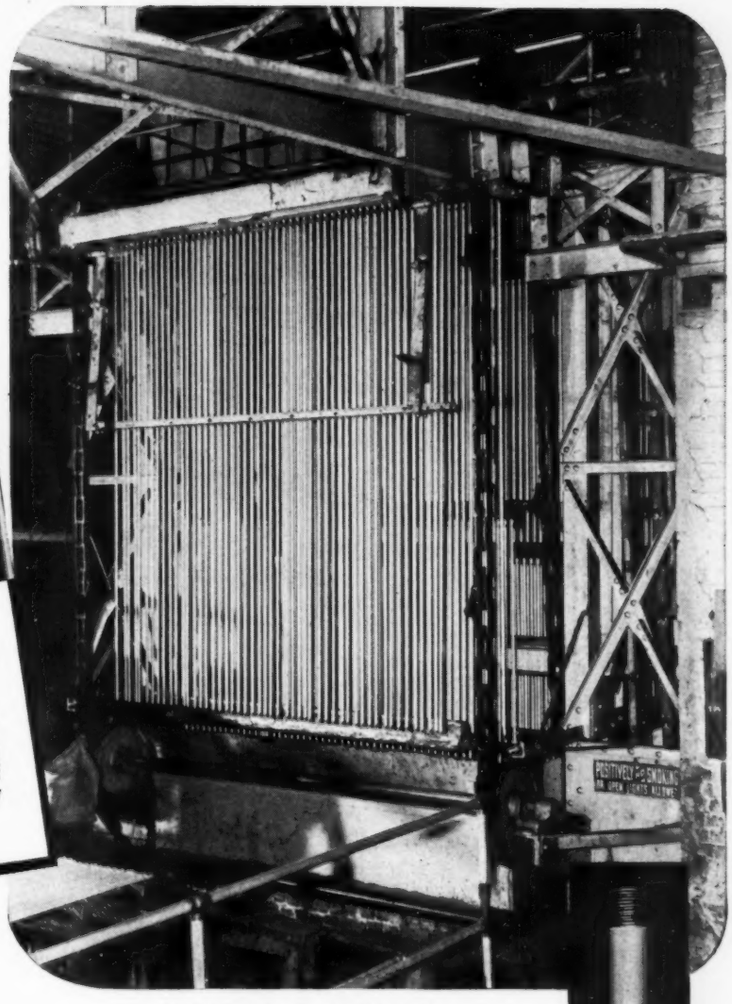
PRE-CAST HANDHOLES

Wiring the numerous flush type contact lights on the runways of the new Washington National Airport at Gravelly Point, Va., required the use of more than 300 concrete handholes which served as pull, splice and connection boxes.

The airport covered some 556 acres

Casmere Teorsky, Lacquering Supervisor, 4 to 12 Shift, at the G-E Conduit Factory, New Kensington, Pa.

Mr. Teorsky began working here 14 years ago and has handled various jobs in the hot-dipped galvanizing department. For the last ten years he has been a supervisor of galvanizing and lacquering operations. Fifty men work under him.



G-E White Entering Glyptal Tank

G-E WHITE
Is Protected by a Glyptal Coating

No. 7 of a Series—Men and Processes Behind G-E Conduit

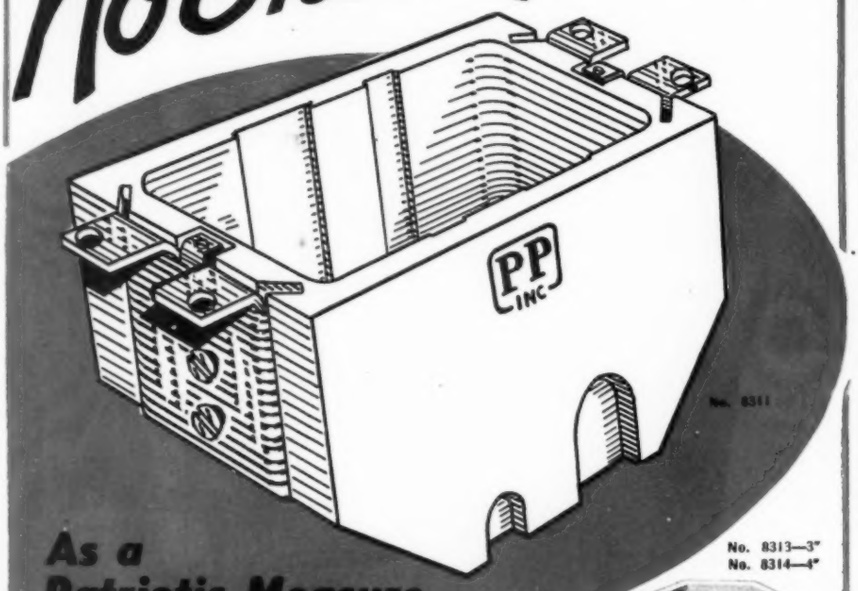
GLYPTAL is used as a final coating on the inside and outside of G-E White conduit to provide added protection and to make the conduit easier to handle. It is a synthetic resin developed by General Electric's research laboratories and is elastic, tough and tenacious. This high quality coating adds an ideal finish to G-E White.

Glyptal was adopted because it adheres perfectly to the hot-dipped zinc coating and resists acids, alkalies and fumes better than any known product of similar nature. G-E White with thread protectors is dipped in Glyptal which then is baked to a hard protecting surface. Incidentally this glossy coating is a great aid to wire pulling. This process, like the other processes in the manufacture of G-E White, is handled by skilled craftsmen. The Glyptal tank is checked continually and special attention is paid to timing.

For further information about G-E conduit see the nearest G-E Merchandise Distributor or write to Section C-283, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

No Shortage Here!



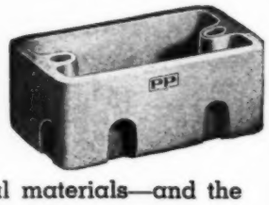
As a Patriotic Measure You can USE

No. 8313—3"
No. 8314—4"

PORCELAIN

To Conserve
Steel, Zinc, Copper, Rubber

No. 8318
No. 8318½—Deep



Porcelain Outlet Boxes involve no critical materials—and the Nation needs, for our war effort, all the steel, zinc, copper, and rubber you can save with non-metallic wiring systems. For actual savings, see Porcelain ad on Page 49 of this issue.

Porcelain Outlet Boxes installed with Knob & Tube and Non-Metallic Sheathed Cable Wiring (as listed by OPM) provide for the greatest savings of critical metals.

At low cost, these boxes give superior safety plus long life. Clamps or connectors are out. Porcelain Boxes are corrosion-proof, rust-proof, fire-proof, short-proof, and shock-proof. Standard sizes, spacing, knockouts, etc., provide for the use of standard wiring devices and covers.

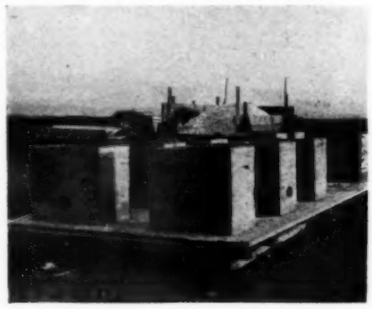
Do your part to conserve critical materials for our war effort—Use PORCELAIN Outlet Boxes (for non-metallic systems). Write for literature today.

PORCELAIN PRODUCTS, Inc.
FINDLAY, OHIO

WIRING Methods

[FROM PAGE 34]

so the H. P. Foley Company, electrical contractors on the field lighting, located their field office in a central spot and proceeded to construct their own handholes. Steel cover flanges and covers were secured, forms made, sleeves inserted and the handholes poured in dozen batches with transit-mixed concrete. When the concrete was



MASS PRODUCTION of pre-cast concrete handholes was employed in the field lighting installation at the new Washington National Airport.

set sufficiently, the forms were taken off, reassembled and a new batch poured. After the concrete was cured, the handholes were loaded on a truck and spotted at their proper field locations. Mass production methods such as these in the field saved considerable time and money on the project.

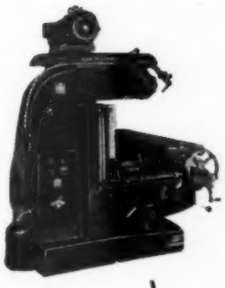
TWO-VOLTAGE OUTLETS IN HOME

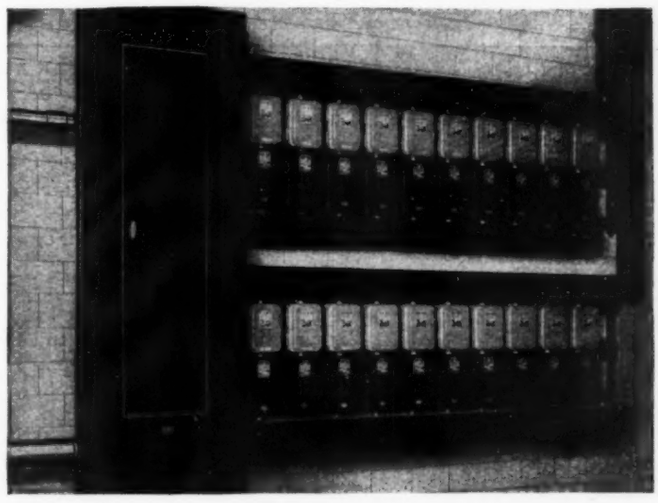
Double voltage convenience outlets were recently installed in certain portions of a residence wired by Hatzel & Buehler, Inc., electrical contractors and engineers of Wilmington, Del.

The two voltages used were 110 volts for the ordinary electrical appliances and six volts for christmas tree lights, candelabra, electrical toys and other low voltage devices. A two-wire, three-wire duplex receptacle was used. The two-wire side was connected to the 110-volt system for ordinary appliance use and the three-wire side was connected to the six-volt doorbell system. Two separate armored cable circuits fed each outlet box, one for the six-volt side; the other for the 110-volt side.

This arrangement was permissible because the circuit wires of the two systems were separately enclosed in the cable armor and the six-volt system originated, through a signaling transformer, at the 110-volt service.

KEEP 'EM HUMMING . . . TO KEEP 'EM FLYING





Don't let

"DOWN TIME"

pull your production punches . . .

TRUMBULL MOTOR CONTROL

TRUMBULL MAKES . . .

Magnetic Starters in the four standard sizes, rated from 2 to 50 h. p.

Combination Starters which combine the above starters with Motor Circuit Disconnect Switches, in one cabinet.

Manual Starters (2 to 7½ h.p.) with interchangeable relay heaters.

Thousands of thumb-worn push buttons tell their own story of the way motor controls are being used today . . . and why "down time" is sure to pull production punches where obsolete or inadequate control "hook-ups" fail under the strain.

Trumbull can help you in two ways to keep 'em humming and "keep 'em flying".

First, by providing motor control devices having Trumbull proved "non-stop" features that keep vital production line motors running 24 hours a day . . . such as vertical dust-free sliding contacts . . . accurate calibration, high interrupting capacity . . . instant accessibility of parts.

Second, by helping you replace troublesome installations with compact, modern streamlined units that harmonize with today's machine and plant design and provide the last word in electrical protection . . . ***plus,*** motion-saving, work-speeding centralization of manual, push-button or automatic control in a wide range of combinations.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY
PLAINVILLE, CONN.

OTHER FACTORIES AT NORWOOD (CINN.) O. — SEATTLE — SAN FRANCISCO — LOS ANGELES — TRENTON, N. J. (PORCELAIN)

How to pull extra Ma

TODAY IN 7 MODERN PLANTS men and women work night and day to make the slim glass lamps that are helping war workers produce more tanks and bombers and anti-aircraft guns. Back of these G-E fluorescent lamp factories is G-E's Lamp Development Laboratory, where this girl is one of many workers constantly checking to see that G-E MAZDA F lamps *stay brighter longer!*

Hours out of a Glass Tube...

NO TIME OUT taking work over to a window in this 24-hour "indoor daylight"! 18,000 40-watt G-E MAZDA F lamps were installed in this new plant, now producing a vital war weapon. Production is speeded up. Workers are happier, less tired, because they conserve energy through easier seeing. Interested? See your G-E lamp supplier or write General Electric Co., Nela Park, Cleveland, O.

G-E MAZDA LAMPS

GENERAL ELECTRIC

Made to stay brighter longer

Questions ON THE Code

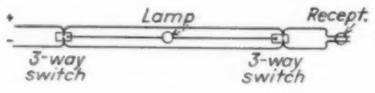
Answered by

F. N. M. SQUIRES

Chief Inspector New York Board of Fire Underwriters

Three Way Lighting

Q. *"Is this type of 3-way to a residence garage permitted by the Code? Only three wires required and still have a hot circuit to garage."* —*C. W.*



A. No, this is not the correct method to be used to comply with the National Electrical Code. Such an installation would be in violation of Sections 2004, 2008g and 3802. The proper method is to run four wires between the house and the garage.

Re 230 Volt Circuits

Q. *No. 1. "In a locality where the utility's standard service is 2-wire 230 volts, it is desired to use plug fuses for the sake of non-tamperability. The utility's secondary system is 2-wire 230 volts, but grounded at every transformer neutral, so that actual voltage between any conductor and ground is 115 volts.*

"(a) Would the use of plug fuses come under the exception provided in Section 2421 of the Code for 'circuits of a system having a grounded neutral and no conductor at more than 150 volts to ground?'

"(b) If not, would there be any serious objection to such practice, as a matter of personal standards, there being no municipal Code enforcement in the locality, and the utility being agreeable to it?"—E. O. L.

A. No. 1. (a) The use of plug fuses, and therefore of the Type "S" or sometimes so-called non-tamperable fuse is permitted in the type of circuit described above by the second sentence of Section 2421. Of course fuses would be required in both of the ungrounded conductors of such circuits in which case there would be two 125 volt fuses operating in series on a short circuit of 230 volts between conductors and one 125 volt fuse operating on a short to ground of 115 volts.

(b) This operation of two fuses in series on a 230 volt short is supposed to be alright but there are reports now and then that only one of the fuses opens on the full voltage and that then the final plug and sometimes the cut-out bases are blown to pieces.

Q. *"Where 2-wire 230 volts is standard service (as in the above).*

"(a) Would sub-paragraph d of Section 2108 apply without change, or would it be reasonable to reduce the amperes load specified by ½, on the assumption that these are given for a nominal voltage of 115 rather than 230?

"(b) Similarly, would it be reasonable, or in accordance with the 'spirit' of the Code to use only No. 14 instead of the No. 12 conductors required by Section 2109, considering the difference in voltage basis?"—E. O. L.

NEW CHAIRMAN of Illinois Chapter, I.A.E.I., T. P. Willerton (left) accepts gavel and congratulations from retiring chairman D. J. Talbot. Mr. Willerton is the chief electrical inspector of the Commonwealth Edison Company, Chicago.

A. No. 2. Section 2105 of the National Electrical Code states that, "In dwelling occupancies, the voltage between conductors supplying lampholders of the screw shell type, receptacles, or appliances, shall not exceed 150 volts, * * * *."

This, therefore, would preclude the use of the system described in the question unless the lighting was accomplished by means of lampholders of other than the screw shell type.

But such circuits could be used in other than dwelling occupancies in which case Section 2007 requires that, "Switching devices in such circuits shall have a pole in each ungrounded conductor * * * *." This prohibits the use of the common single pole key socket.

(a) It certainly is reasonable to reduce the amperages given in Section 2108d by one half as the amperages given were certainly chosen with a voltage of 125 volt in mind.

The Code itself, however, is not definite on this and the only other reference which comes to mind and which deals with a similar condition is in Section 4343a where motors of ratings of 6 amperes or less may be grouped on a single motor branch circuit protected at not more than 15 amperes at 125 volts or 10 amperes at 250 volts.

(b) While it might be reasonable it does not seem to this writer to be permissible to use No. 14 wire instead of No. 12 for the receptacle circuit required by 2109 even though the receptacle coupled with 2111c and no screw shell lampholders were used.

If it were permissible to use No. 14 wire for this circuit would it be considered permissible to use No. 16 wire for circuit wiring under a similar "reasonable spirit of the Code?"

No, the line has to be drawn somewhere.

Transformer Vault

Statement—The questions concern a transformer vault in a building. One of the outside walls of the building forms one of the walls of the vault. The underground incoming service is 13200 volts, 3 phase, 3 wire, originating at a set of drop out fuses at an outdoor sub-station in the project about 500 feet away. It is proposed to terminate the service in

SHIPS WILL WIN THE WAR

Ships for every ocean . . . ships for every need . . . battleships, cruisers, carriers, submarines; ships for troop transport and supply . . . ships will win this war.

For with ships and ships only, can the ever increasing stream of men, machines and munitions be delivered to defeat the enemy wherever he may be found.

To build these ships in time, all of us must help . . . not only the worker in the shipyard . . . but the molder in the mill . . . the tool maker in the factory . . . the railroad man and miner . . . the electrician and power engineer . . . and the rest of us by buying Defense Bonds. These are mighty hammer blows for Victory.

THE OKONITE COMPANY
Insulated Wires and Cables, Passaic, N. J.

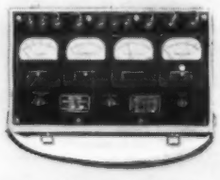
★ **Here at our 3 factories men and machines work night and day to build the insulated wires and cables that provide safe, sure electrical power and control for the ships that will win the war.**

Forestall trouble

BEFORE TROUBLE *STALLS* MEN AND MACHINES!

WESTON MODEL 785
Industrial Circuit Tester

An ultra-sensitive multi-range instrument . . . provides 27 voltage, current and resistance ranges (DC voltage sensitivity 20,000 ohms per volt).



WESTON MODEL 639
Industrial Analyzer

Has all interconnections made — designed to quickly analyze industrial loads by measuring current, voltage and power in single and polyphase circuits as well as power factor in 3 phase circuits.

WESTON MODEL 703
Illumination Meter

Provides for direct measurement of all types of lighting . . . incandescent, mercury vapor, fluorescent, daylight, etc. No corrections necessary.

Clamp-Ammeter testing is the simplest, quickest method for keeping machinery ON THE LINE!

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For testing other electrified equipment, such as sensitive relay circuits, cathode ray or photoelectric equipment, sound systems, or even plant lighting, WESTON has designed test instruments of equal simplicity and adaptability for today's requirements. The WESTON representative near you will be glad to give you complete information. Weston Electrical Instrument Corporation, 672 Frelinghuysen Avenue, Newark, New Jersey.

WESTON *Instruments*

Questions on the Code

[FROM PAGE 40]

a 3 conductor capnut type pothead and feed the high tension bus direct. The bus in turn supplies two separate 3 phase transformers, each through a set of three single pole disconnect switches. One is a 300 kva. for 220 volt, 3 phase, 3-wire power. The other is a 100 kva. for 120-208 volt 3 phase 4 wire lighting. The secondary cables from the transformers are in short conduit nipples through one of the inside walls and connect directly to the respective main light and power distribution panels which are of the pull-fuse dead front type. Note that no primary or secondary over-current protection is provided nor any direct convenient means of disconnecting the service.—M.A.E.

Q. *1—"Does the above arrangement violate the National Electrical Code?*

A. 1—The final sentence in the statement states that there is no primary or secondary overcurrent protection nor any direct convenient means of disconnecting the service and yet in the second sentence "drop out fuses" in the substation are mentioned and in the next to the last sentence "pull-fuses" are mentioned.

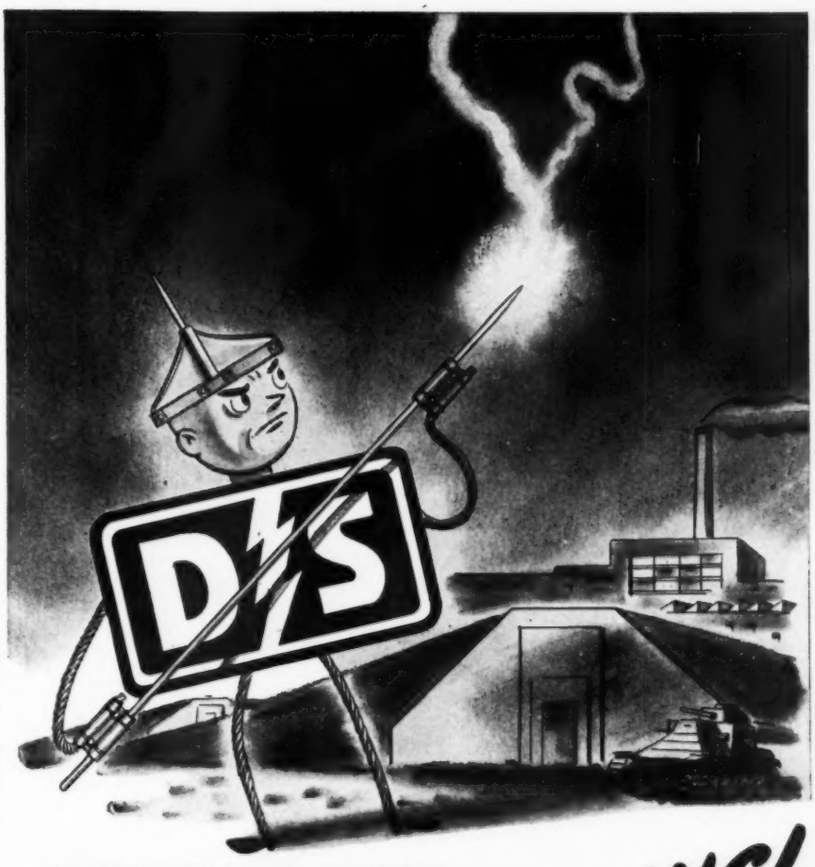
The "drop-out fuses" in the substation provides overcurrent protection for the high tension feeder and for the transformers and the pull-fuses of the distribution panels provide the service disconnecting means. We must assume, of course, that the pull-fuses are of the type which are approved as also being switches.

Then, the answer to Question 1 is that, if there are three main pull-fuse switches on each of the two distribution panels the Code is complied with, but that if there are no main switches on each of the panels and if there are more than six manual operations needed (that is, more than 6 pull-fuse switches to pull) to disconnect the secondary service from the building, there is a violation. See Section 2351a.

Q. *2—"If so, would main manually operated automatic enclosed type air circuit breakers of proper interrupting capacity provided in the respective main secondaries from each transformer, eliminate such violations?"*

A. 2—Yes.

Q. *3—"Would it be permissible to install these breakers just outside the vault adjacent to each respec-*



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—BY STANDING GUARD AGAINST LIGHTNING!

★ On U.S. powder magazines, arsenals, and ammunition loading lines . . . on power stacks and the buildings of many factories where the tools of victory are being forged . . . West Dodd Lightning Protection and static control equipment is doing its bit.

And the reason? Simply a case of playing safe. For records of the National Board of Fire Underwriters' prove that lightning causes a lot of damage . . . is a leading source of fire. Yet there is nothing against which you can be more certain of protection.

West Dodd . . . oldest manufacturer of lightning protection equipment . . . builds systems for all purposes, carrying the approval of the National Board of Fire Underwriters', American Institute of Electrical Engineers, and other competent authorities. West Dodd lightning protection equipment is inspected and labeled in the plant by Underwriters' Laboratories, Inc. *Immediate delivery.* Write for details today.

FREE The West Dodd Engineering Dept. will be glad to assist in planning application, or estimating costs.

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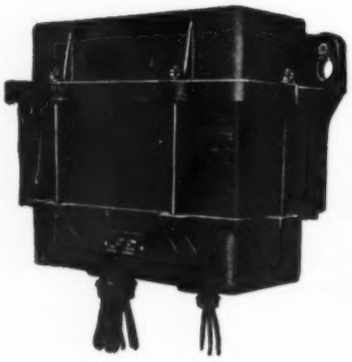
LIGHTNING CONDUCTOR CORP.

A RELIABLE PROTECTION AGAINST A LEADING CAUSE OF FIRE

D/S

GOSHEN, INDIANA

FOUR POINT ECONOMY—



Above: Type CFT, three-phase, outdoor-type, air-cooled, general-purpose transformer.

Below: Type CF, Single-phase, outdoor-type, air-cooled, general - purpose transformer.

1 LOW INITIAL INVESTMENT

2 EASY TO INSTALL

3 MINIMUM MAINTENANCE

4 EFFICIENT IN OPERATION

Whenever it is desired to obtain a low-voltage supply from a higher voltage circuit you will find AmerTran Type "CF" Air-Cooled Transformers both economical and convenient to use. These moderately priced units may be installed wherever they are needed—either outdoors or indoors*—without the necessity of oil, fire-proof vaults or enclosures. All sizes are equipped with either conduit fittings or a built-in junction box to facilitate installation, and both single-phase and polyphase types are furnished as a single unit. Available in capacities up to 100 Kva. and for potentials up to 2400 volts, all ratings offer low initial investment, minimum installation and maintenance expense, and low operating cost. Let us send data on equipment to meet your needs. Ask for bulletin 1116A.

* Units rated 15 Kva. and larger for indoor service only.

Type "CF" Applications

1. Stepping down power circuit voltage to 115/230 volts for lights, small motors or heating elements. In this way advantage may be taken of lower power rates for low-voltage loads.
2. Obtaining a 3-wire circuit from a 2-wire system.
3. Changing from 3 phase to 2 phase, or vice versa, on a power system.
4. Obtaining low voltage for heating, welding, 32-volt tools, special lighting, testing, etc.
5. Balancing load on 3-phase systems.
6. Insulating one circuit from another.
7. Distributing power at 600 volts or less.
8. Reducing light flicker.
9. Obtaining special voltages to permit efficient operation of equipment.

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American Transformer Co. manufactures transformers for every industrial, electronic and laboratory application in sizes up to 10,000 Kva and for potentials up to 132 Kv. Other products: voltage regulators, test sets, rectifiers.

AMERTRAN TRANSFORMERS

Manufactured Since 1901 at Newark, N. J.

Questions on the Code

[FROM PAGE 43]

tive distribution cabinet or would they have to be installed in the vault?"

A. 3—These should be installed at a point nearest to where the secondaries enter the building from the transformer vault, that is, in this case, just ahead of the distribution panels. They should not be in the transformer vault as they must be readily accessible which they would not be if in a locked vault.

Q. *4—"The secondaries from the power transformer are six 600,000 cm. Type R.H. wires (2 per leg) and from the lighting transformer four 600,000 cm. Type RH. It is proposed to provide a copper bar ground bus and connect to a ¾-in. by 8-ft. driven ground rod and also by means of a bare wire in conduit to a 1¼-in. water service. To the ground bus will be connected the transformer cases, pipe frame structure and possibly the conduit nipples carrying the secondaries to the main light and power distribution cabinets or main secondary breakers.*

"It is also proposed to connect the system neutral by means of a bare cable in conduit to the 1¼-in. water service. This wire may also be used to ground the main light and power distribution cabinets or main secondary circuit breaker housings.

From the description given, I would like to have your recommendations as to the sizes of the following: copper bar ground bus in the vault, ground wire from ground bus to driven ground, ground wire from ground bus to water service, ground wire from secondary equipments and system neutral to water service. The 1¼-in. underground incoming water service nearby will be extended by 1¼-in. nipple into vault and should have water in it at all times."

A. 4—The principal grounding electrode in this case is the 1¼-in. water service. Much reliance cannot be placed upon the driven pipe electrode unless there are very favorable soil conditions. The "ground bus" becomes a grounding conductor and the carrying capacity of this and also of the conductor used for grounding the secondaries of the transformers and also the conductor grounding the conduit nipples carrying the secondaries, should all, according to Section 2594 be the equivalent of No. 000 wire, inasmuch as the service conductors (secondaries) are two 600,000 cm. cables per leg or an equivalent of 1,200,000 cm. wire.

Also according to Section 2594 the

VARNISHED CAMBRIC CABLE • RUBBER POWER CABLES • BUILDING WIRE

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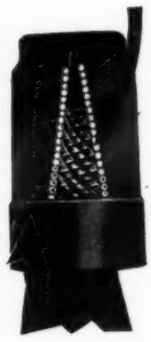

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Ideal "Wire-Nuts" are not only quicker, but do a neater, cleaner, more craftsmanlike job. Take up little space. Can be used in small outlet boxes; in fact anywhere that a solder-and-tape joint can be used. Better electrically; stronger mechanically:—will withstand nearly 3½ times more pull than the best soldered joint. Safer; no open flame hazard. FULLY APPROVED—Listed by Underwriters' Laboratories, Inc.

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Save time-wasting and expensive tape breakage. Keep tape under control at all times. Three tools in one:—Tape—Reel—Puller.

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Saves time-wasting snarls and knots in coiling and handling of wire, cable, cord, etc. Hang singly or in tandem from pipe, joist or beam. Saves wire. Inexpensive.

BX ARMOR CUTTER

No time lost or BX wasted with this pocket-size tool. Simple to use as cutting paper. Includes hardened steel cutting blade easily removed for sharpening.

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Quickly strips or cuts solid and stranded wire with one squeeze. Always ready for use. No wasted or nicked wires. Four sizes for No. 30 to No. 8 Wire. Weight, 12 ounces.

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Please send me FREE Samples of IDEAL "Wire-Nuts".

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.....

Questions on the Code

[FROM PAGE 44]

conductor running to the driven pipe electrode need not be larger than No. 6 and according to Section 2595 with service capacity or overcurrent protection devices in the neighborhood of 100 amperes (two 600,000 cm. in parallel, type R.H. = 844 amps.) the equipment grounding conductor should be not less than No. 00 wire.

A word of caution about the water pipe nipple running into the transformer vault: this should *not* contain water at any time.

OFFICIAL INTERPRETATIONS

by the

Electrical Committee of the N.F.P.A.

Interpretation No. 221

QUESTION . . . Does 4322-b require, for motors of 1 horse-power or less which are manually started and which are located within sight of the operator, that the motor running protection be as supplied in columns 5 and 6 of Table 20?

ANSWER . . . No, the values given in columns 5 and 6 of Table 20 are intended to apply to motors taking the current given in column 1 of the table, and which are required by other provisions of the Code to have individual overcurrent protection.

Interpretation No. 222

QUESTION . . . When must a disconnecting means for a group of small motors be rated in horsepower?

ANSWER . . . A single disconnecting means employed with a group of motors as provided in section 4410, shall be rated in horsepower as required by 4402-b, when the sum of the ratings of all motors in the group exceeds two horsepower.

Interpretation No. 223

QUESTION NO. 1 . . . Does 2304-a permit an open individual conductor of a service drop to be without rubber or weather-proof insulation?

ANSWER NO. 1 . . . No, the requirements of sub-paragraph (c) of this section are intended to apply.

QUESTION NO. 2 . . . Does 2304-c prohibit a grounded bare neutral service drop conductor when individual conductors are used and the voltage is not in excess of 208 volts to ground?

ANSWER NO. 2 . . . Yes.

Switch to Safety

and assure trouble-free operation with the new

(FA) SHUTLBRAK SWITCH

For motor circuits, service entrance, or any installation requiring an operating switch.

Type A, in ON position; door interlocked with handle — fuses not accessible when ON.

This heavy duty industrial switch embodies entirely new *ideas* in design and construction.

THE roller type main contact and auxiliary contacts are enclosed in an insulated shuttle. This shuttle assembly in turn is entirely surrounded by insulating material. There is an arc resisting barrier *at all times* between the line and load contacts — and contacts are *held under compression* in ON position. Silver plated current carrying parts insure low resistance. Properly engineered springs assure quick make and quick break.

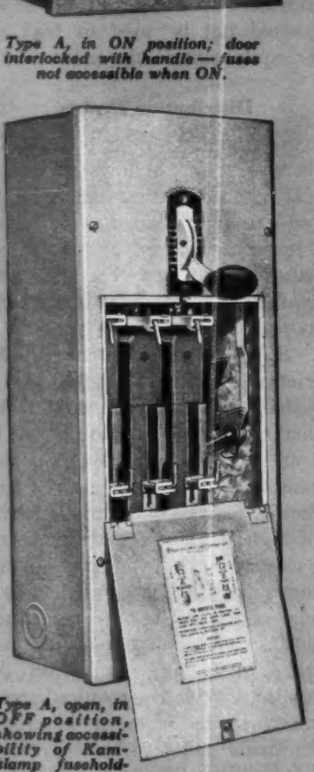
As an additional safety factor, Type A is equipped with an interlocking arrangement between the operating switch lever and the door of the fuse compartment. The door *cannot be opened* when the handle is in the ON position. (Type B does not have this interlocking feature).

Enclosures have ample wiring space at top, bottom and *at rear* of the switching mechanism. Attractively finished in pearl grey enamel.

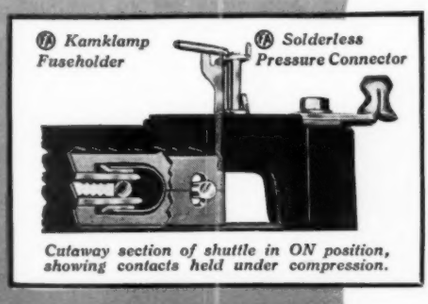
Front operated, the (FA) Shutlbrak Switch may be used singly, banked in groups, or assembled in compact, well designed switchboards and panelboards. Equipped with (FA) Kamklamp (pressure type) fuseholders for either ferrule or knife-blade types of fuse terminals. Also the new (FA) Solderless Type, Pressure Connectors.

Capacities at present: 30 to 400 amp., inclusive, for 250 volts AC or DC, and 575 volts AC, in 2, 3 and 4 poles. (Larger capacities in preparation). Approved by Underwriters' Laboratories as an Enclosed Switch.

For detailed information, and suggested specifications for Shutlbrak Switches, Panelboards and Switchboards, write for Bulletin No. 59 . . . Frank Adam Electric Company, St. Louis, Mo.



Type A, open, in OFF position, showing accessibility of Kamklamp fuseholders.



Cutaway section of shuttle in ON position, showing contacts held under compression.

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Frank (FA) Adam

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For Industry

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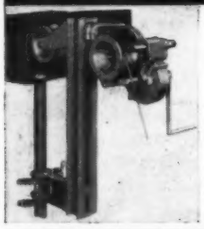
Cut labor costs and save vital hours on your defense jobs by turning to a better use of tools. Greenlee Tools are saving hundreds of contractors on defense jobs from 15 to 75% in time and labor costs by making the work easier and faster for the man on the job.

COMPLETE LINE OF BENDERS

For any bending job there's a Greenlee Bender. Small hand benders and powerful hydraulic benders for conduit, pipe and tubing from ¼ to 4½-inch size. Benders that are easily operated by one man, save the cost of many manufactured bends and fittings, are compactly built in one unit, and are easily carried to the job and set up.

No. 765 CABLE PULLER



This handy Greenlee Cable Puller clamps right on to the conduit through which cable is pulled, is easily carried to the job, can be set up in a jiffy, and is easy for one man to operate with one or two cranks and will save many hours of work when pulling in cable.

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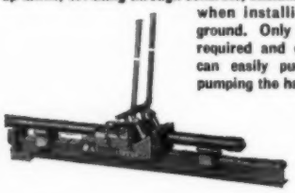
Enlarge holes without long tedious drilling, reaming and filing with Greenlee Knockout Punches and Cutters. This handy tool is inserted in a knockout or a small drilled hole and a smooth accurate hole can be quickly cut by turning the drive nut with an ordinary wrench.

HYDRAULIC PIPE PUSHERS

Greenlee Pushers eliminate digging long trenches, tearing up lawns, breaking through concrete, backfilling, and tamping when installing pipe underground. Only a short trench is required and one or two men can easily push the pipe by pumping the handles.



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Welder Busbar Distribution

[FROM PAGE 20]

It should be recognized that savings in the initial cost of supply transformers and the distribution system can be affected by selecting efficient welder equipment which draws a minimum kva. from the primary service. Economics in supply transformers can be improved by selecting a distribution system which has a minimum voltage drop. Factors upon which an efficient welder distribution system depend are—the supply transformers and the selection of the proper capacity and design of the enclosed busbar system.

The Supply Transformers

Since most resistance welding machines are equipped with single phase transformers, the first decision to be made is whether the secondaries of the supply transformers should be connected single or 3-phase. The number and kva. rating of connected welding machines, the availability of power company service, and the availability of transformers are determining factors in the type of secondary supply transformer connections best suited for a particular installation.

It is the nature of the system, although excellent designs are available for single phase, that a 3-phase secondary service provides the best regulation and greatest economy. The load may be balanced on the 3-phases throughout the system, thereby reducing peak demands and improving voltage regulation, both on the secondary and primary side of the supply transformer. Also, diversifying the load reduces the total cross-sectional area of copper required for equivalent thermal and voltage drop efficiency, thereby lowering cost of the system.

The ratio of supply to connected load is usually determined by the largest welder connected. A survey of many successful installations has shown that on 3-phase systems, the ratio of transformer capacity to connected load averaged 1.5, and on single-phase systems 1.2. The average ratio of the largest single welder to total supply transformer capacity on 3-phase systems was .25 and on single-phase systems .40. It has been stated that thermal load is generally not a factor in the welder busbar distribution system and this is borne out in this survey, which indicated ratio of thermal load to total connected load to be .10. Supply transformers for serving groups of welders should not be used to feed other power equipment in the plant.

Distribution Design

In the designing of a busbar distribution system for welding service, two sets of characteristics must be considered—electrical and mechanical—and each must be adapted and adjusted to the other if satisfactory results are to be obtained. Among these the principles are as follows—

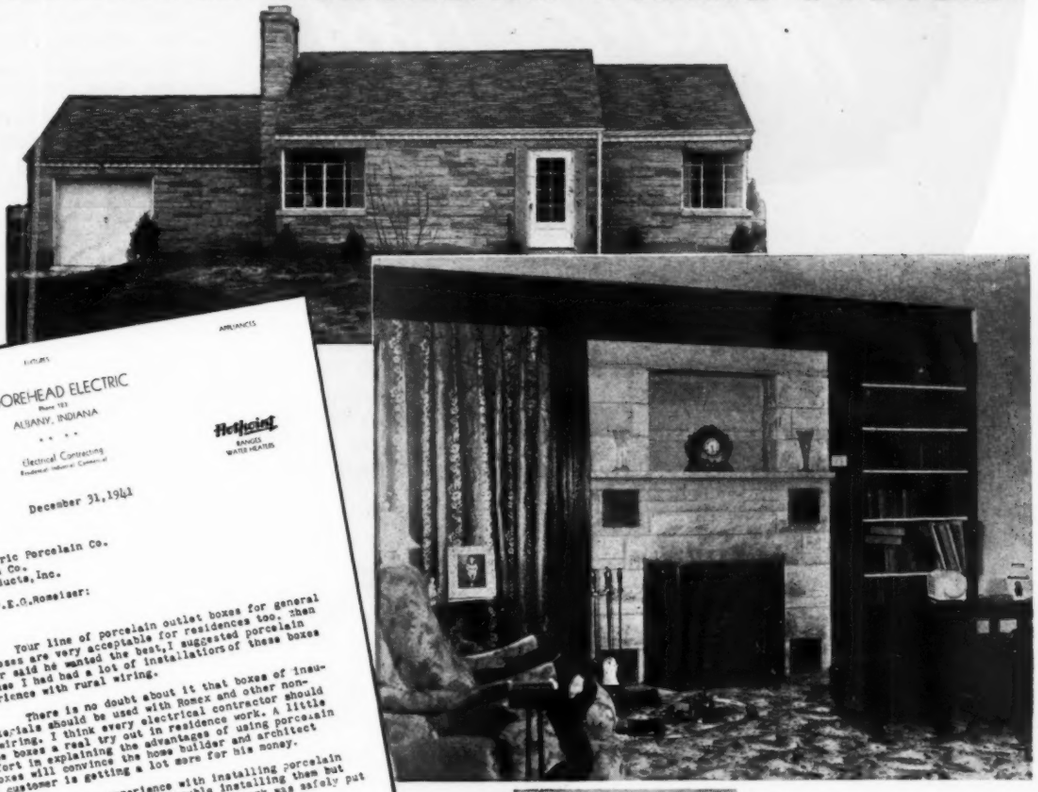
A. Electrical Characteristics—Field experience indicates the use of rectangular busbars ¼-in. thick that are interlaced and arranged with opposite phase relation at 11/16-in. spacings. Polarity clearance between these closely spaced conductors may be obtained through the use of high di-electric strength barriers. The close spacing and interlacing of conductors results in an extremely low impedance drop. The busbar conductors should be rigidly supported on non-carbonizing insulators, spaced on 24-in. centers, to provide the required strength to resist surge voltages inherent to welder loads and possible short circuit current stresses.

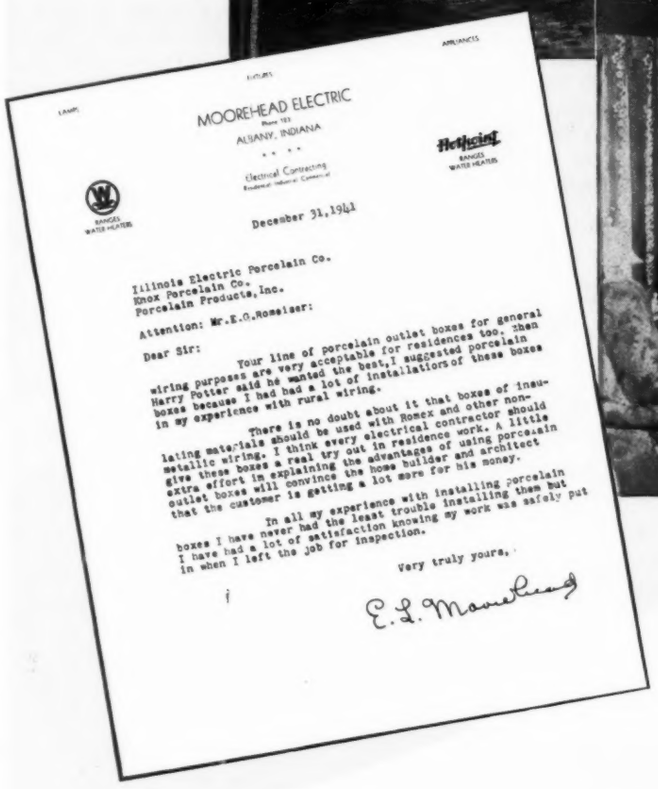
B. Mechanical Characteristics—The system should be designed to meet practical installation requirements of the modern industrial plant. All units of equipment should be standardized to provide the making original installations economical and to make possible future re-arrangements without loss of equipment. Convenient provisions are desirable for connecting welders to the original installation or re-arranging existing welder loads to new locations on the system.

NEW OFFICERS of the Electric Association of the Niagara Frontier, Buffalo, were elected at a recent meeting of the board of directors. They are: (left to right) seated, Raymond W. Mitchell, president; Robert D. Glennie, vice-president; standing, Richard Wable, treasurer; Weldon D. Smith, executive committeeman; Edward T. Ball, vice-president and Samuel S. Vineberg, manager-secretary.

BUILDER-OWNER: ***Wanted the BEST Wiring Installation for his stone-faced home***

CONTRACTOR: ***Installed*** **PORCELAIN WIRING SYSTEM**





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Phone 123
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Electrical Contracting
Residential · Industrial · Commercial

December 31, 1941

Illinois Electric Porcelain Co.
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Attention: Mr. E. O. Romeiser:

Dear Sir:

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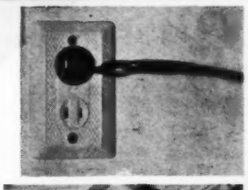
There is no doubt about it that boxes of insulating materials should be used with Romex and other non-metallic wiring. I think every electrical contractor should give these boxes a real try out in residence work. A little extra effort in explaining the advantages of using porcelain outlet boxes will convince the home builder and architect that the customer is getting a lot more for his money.

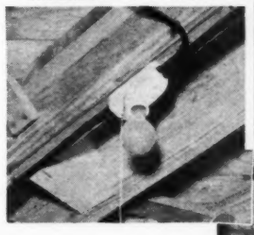
In all my experience with installing porcelain boxes I have never had the least trouble installing them but I have had a lot of satisfaction knowing my work was safely put in when I left the job for inspection.

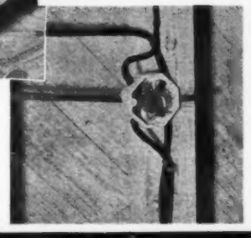
Very truly yours,

E. L. Moorehead



Porcelain Plates are SAFE and attractive.





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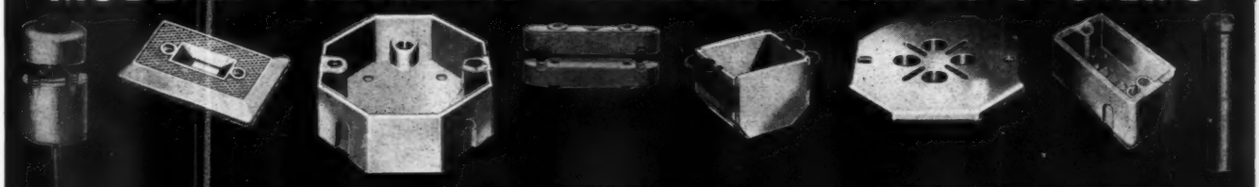

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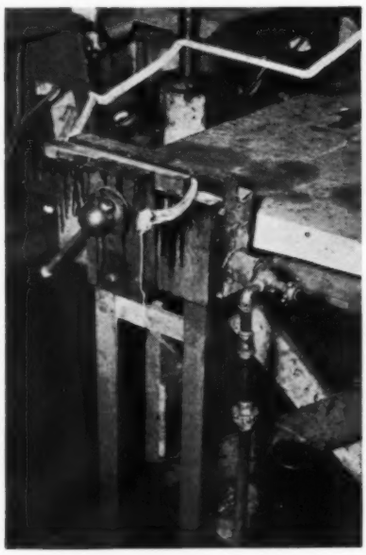
HOT PRESS

The Bridgeport Armature Works of Bridgeport, Ohio, uses a device they call a hot press to make perfect rectangles of sides of coils so they will fit into the slots easily.

The apparatus, as designed and built by this shop, consists of a large steel back plate heated by a single gas burner. The plate is of fairly heavy steel block to withstand pressure and the burner is enclosed to concentrate the heat on the plate. A vise arrangement is attached to this back plate which is supported by heavy flat iron legs, and an angle bracket to the floor. A series of removable steel bars of different sizes are used between the vise and back plate for different size coils. Some modifications of this device have a foot operated lever and spring arrangement in place of the hand operated vise.



***PRESSURE AND HEAT** combine in this hot press to mold coil insulation into perfect rectangular form so coils will ease into the slots without binding or damaging insulation.*

The coils are generally put through this press after they are dipped. They are placed between the heated plate and the removable bar. The vise is then tightened and the pressure and heat combine to mold the insulation perfectly around the copper coil, forming a perfect rectangle and making it easier to insert the coils into the slots. It works well in mining areas where tolerances in mining motors and equipment are close. It also saves a lot of coil pounding and rough handling.

TORQUE TESTING MACHINE

The Electric Service and Machine Co., motor repair shop of Steelton, Pa., subjects all armatures of repulsion-induction and condenser type single-phase motors to a torque test to insure a correct setting of the spring controlling the centrifugal device which kicks out the brush holders.

To determine at what speeds these springs will operate, they built a torque machine. The apparatus consists of a $\frac{1}{3}$-hp. variable speed motor with a $\frac{3}{4}$-inch drill chuck on one end of the shaft and a speed indicator on the other. An adjustable tail piece riding on the hips of two pieces of angle iron and a rope brake complete the machine.

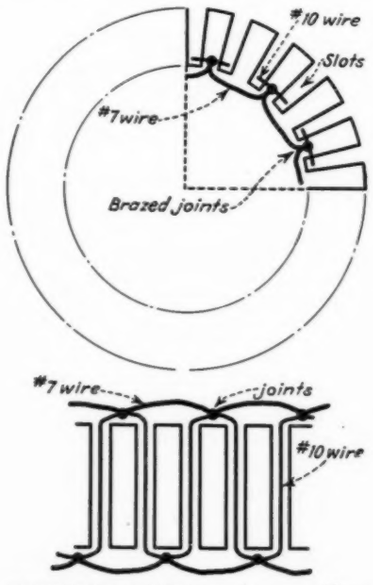
***TESTING SPRINGS** on the centrifugal devices of single-phase, fractional horse-power motors is reduced to a simple and accurate task on this machine. Starting troubles on the job site are materially reduced.*

One end of the armature shaft is gripped by the chuck on the motor and the other end is held in place by the adjustable tail piece. The motor rotates the armature and the rope is used to keep it within rated speed. By holding the brush holders and watching the speed indicator, which is graduated in r.p.m., the operator can determine at just what speed the brushes are kicked out.

If they kick out below or above the proper speed, the spring is changed and one of the proper tension inserted. The governor weights are also checked at the same time. Thus, considerable time and trouble on the job is saved by making these tests and adjustments in the shop before the motor is assembled and delivered to the customer.

SQUIRREL CAGE REPAIR

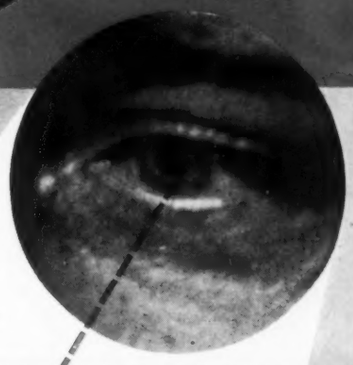
A recent job in the Dodge Electric Supply and Service Company shop in Tulsa, Okla., required repairs on an aluminum squirrel cage in the rotor of an SCR 5 hp. 1,000 r.p.m. single phase motor. Heat had burned out the windings and melted out the aluminum bars.



***FLEXIBLE WIRE** used to replace melted aluminum squirrel cage is looped through slots and joined at ends as shown in this diagram.*

Supt. H. E. Nelson devised a simple repair method that proved successful. Bare flexible shunt wire, No. 10, was looped back and forth through the slots of the rotor. Copper rings were formed at each end with No. 7 flexible shunt

YOU CAN *See* THE SEAL



YOU TAKE NO CHANCES IN HAZARDOUS LOCATIONS WITH APPLETON VISIBLE "SEAL-LINE" UNILETS

"VSU" SERIES
CATALOG NUMBERS
28,500 through 28,525

You *know* the line is *sealed* when Appleton "Seal-Line" Unilets are used — because you actually *see the seal,* when the cover of the fitting is removed. Inspection is quick and positive . . . guesswork is eliminated! Your men can *see* what they're doing when they pack in the filler and pour sealing cement.

Appleton "Seal-Line" Unilets are an *exclusive, patented* Appleton development. They provide the only *truly visible* method of sealing . . . the last word in safety for switches, receptacles and all other equipment in hazardous locations.

Smooth, rugged, cast malleable bodies, heavily cadmium coated. Cover faces are ground for perfect fit. Equally suitable for horizontal and vertical installation. Immediately available in all sizes from ½-inch to 2-inch . . . subject to priority rulings and allotments . . . with larger sizes available soon.

"Seal-Line" Unilets typify the advantages of the *complete* Appleton line, which includes exactly the type and size of fitting needed for every installation — expertly designed; sturdily and accurately made; conforming strictly to every code requirement. They're America's "STANDARD FOR BETTER WIRING!"

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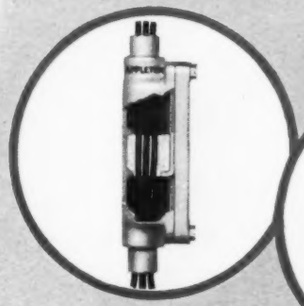


SECTIONAL VIEW
Sealing cement in place and clearly visible for inspection when cover is removed.

DISPOSABLE FUNNEL
Simplifies pouring cement. Saves time; prevents muss. Furnished with each fitting.

APPLETON

CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

This year a new and bigger opportunity awaits you

Westinghouse Mazda

This year America's mighty Victory program swings into high gear. Thousands of plants, both new and old, and some yet to be built, must be kept bright with light 24 hours a day!

Needed and wanted in these plants is the bright, abundant light, and the added efficiency and economy of Westinghouse Mazda Fluorescent Lamps. Through 55 years of making fine electrical products Westinghouse has gained the reputation for advanced engineering, quality control, and precision manufacturing.

When you say "Westinghouse Mazda" your fluorescent lamp prospects know you are recommending the top-quality lamps with greater dependability and economy. This is the year for you to swing into high gear, too, with *Westinghouse Mazda.*

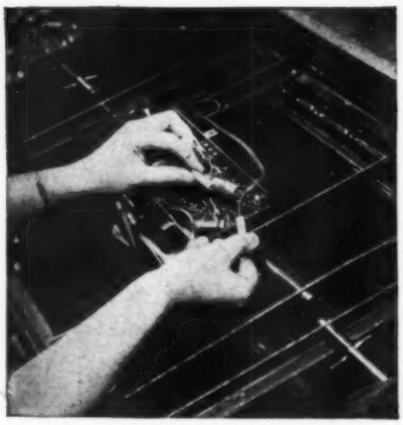
Better light builds America's might

Today the emphasis is on quality. Plant owners and operators want the lighting equipment that offers them the utmost in dependability and economy. That's why, when you sell a complete lighting job or lamps for replacement, it pays to sell Westinghouse Mazda Fluorescent Lamps. These quality-built lamps are uniform in color, remarkably efficient in use of current, and exceptionally long lasting.

Enlist the cooperation of your Westinghouse Mazda Lamp Distributor. You'll find he knows fluorescent lighting thoroughly and is prepared to help your business. Why not get in touch with him today? Westinghouse Electric and Manufacturing Company, Lamp Division, Bloomfield, New Jersey.

For DEPENDABLE Fluorescent Lighting consult your

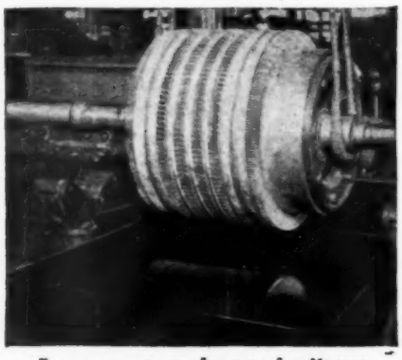
Westinghouse MAZDA LAMP DISTRIBUTOR



G-E Varnished Tubing used on power leads in radio chassis for extra protection.

G-E Twine being applied to front end of commutator to provide extra protection.

G-E Varnished Tubing applied to coil leads affords extra protection.



Large armature about to be dipped into G-E Insulating Varnish for extra protection.

PREPARE

WITH *Extra Protection* .. USE

G-E INSULATING MATERIALS

Victory demands preparedness. Insist that your equipment is prepared with the *extra protection* of G-E Insulating Materials.

The complete line of high-quality General Electric Insulating Materials is fully described in the G-E Insulating Materials Catalog. For a copy, please see your nearest G-E Merchandise Distributor, or write to Section M-283, General Electric Co., Appliance & Merchandise Department, Bridgeport, Conn.

GENERAL ELECTRIC

Motor Shops

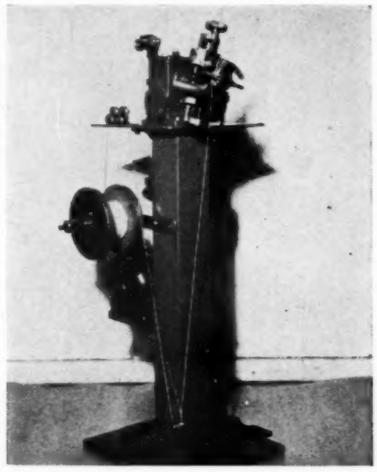
[FROM PAGE 50]

wire worked through the loops and brazed at each joint. This method occupied little space and left ample room for rewinding the repulsion coils.

INTEGRAL TENSION DEVICE

Unit compact operation of all machines with as little floor space as possible taken up by auxiliary equipment, is a goal set by the A. L. Brown Associates, Inc., motor repair shop of Worcester, Mass.

One of the steps taken to achieve this, was the mounting of magnet wire spools and tension devices on as many winding machines as was practicable. The space formerly taken up by stationary reel racks and intermediate tension devices is now used for other purposes.

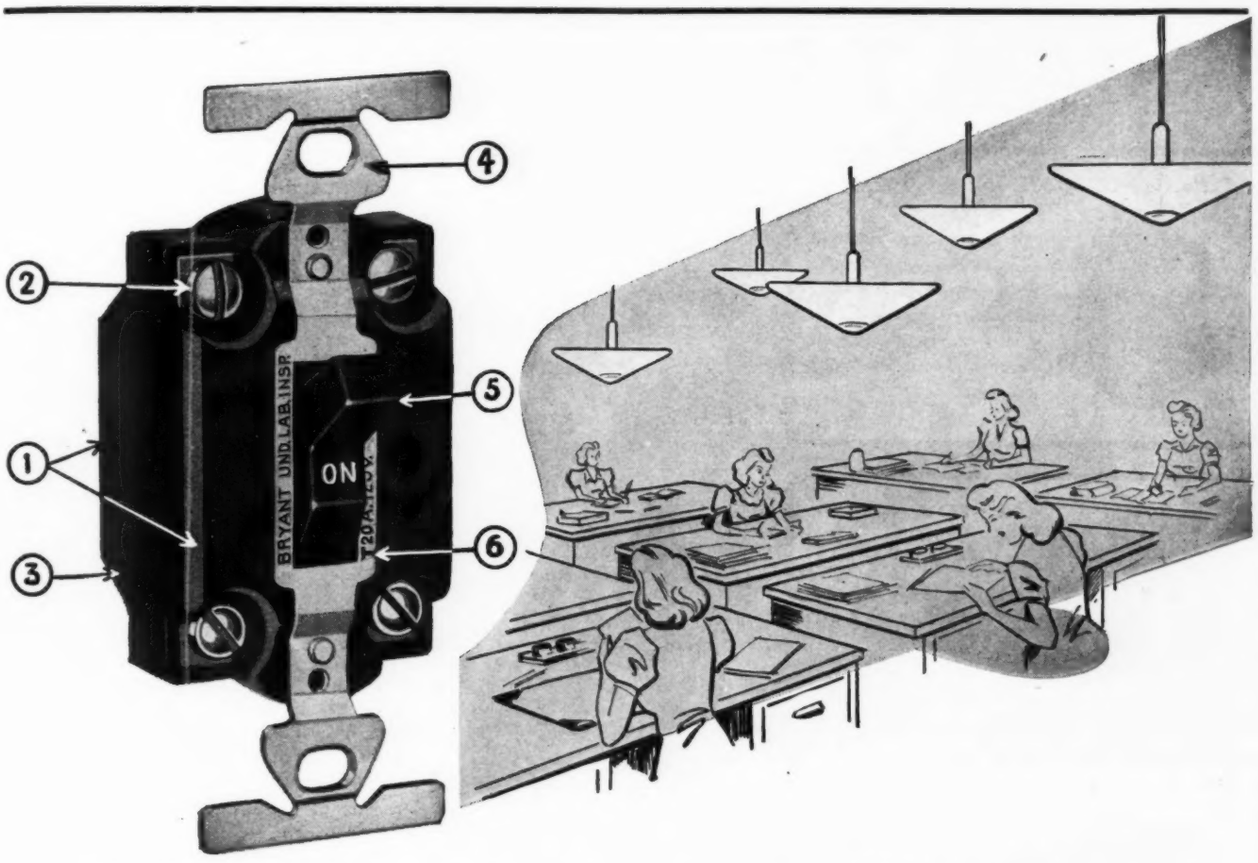


***REEL SUPPORT** and tension device mounted directly on this winding machine increases the efficiency and workmanship of small armature rewinding and forms a compact unit.*

The accompanying photograph illustrates the use of this method on an armature winding machine for winding bi-polar armatures from the smallest to about 3½-inch diameter. The wire reel rotates on a shaft mounted by a flat iron bracket to the machine pedestal. A tapered collar, spring and set screw collar provide the tension on the revolving reel. The magnet wire is threaded through several small grooved wheels at the top of the machine, down and over one at the base, then up into the armature slots.

A foot pedal attached to a clutch operates this machine which turns out the

New Shallow 20 Ampere Switches



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BRYANT

SUPERIOR WIRING DEVICES

SOLD THROUGH ELECTRICAL WHOLESALERS NATIONALLY

1. 1½ INCHES DEEP—Fits shallow boxes.
2. EASY TO WIRE—Large binding screws recessed to facilitate wiring.
3. BAKELITE ENCLOSED—Fully enclosed in rugged bakelite.
4. INSULATED YOKE—One-piece design yoke, with plaster ears. Completely insulated from mechanism.
5. UNBREAKABLE PLASTIC HANDLE — Made in Brown, Ivory and Black. Also available in Lock and Momentary types.
6. FULLY APPROVED — U. L. "T" Rated. Conforms with Federal Specifications.

CATALOG NUMBERS

Single-Pole	No. 5861	Three-Way	No. 5863
Double-Pole	No. 5862	S. P. Quad. Break	No. 5866

The new Bryant Shallow 20 Ampere Switches give extraordinary performance at ordinary prices in both industrial and commercial service. Write for new device page 50-B.

ADEQUATE WIRING SERVES AND SAVES

The Bryant Electric Company, Bridgeport, Connecticut

EVERY OUTLET DESERVES A BRYANT DEVICE

FOR EVERY INDUSTRIAL, COMMERCIAL OR RESIDENTIAL REQUIREMENT...

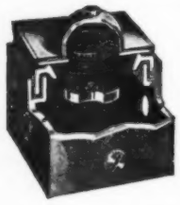
Sell the time-saving line...

LATROBE

FLOOR BOXES *and* WIRING SPECIALTIES

No. 150 BOX WITH No. 207 NOZZLE

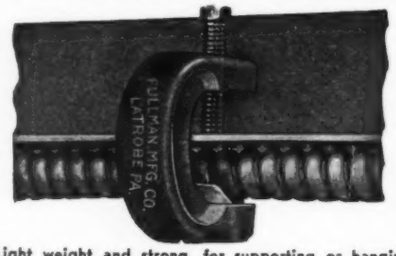
An Underwriters' Approved box, suitable for installation in concrete floors or in wood finished concrete floors. Quickly and easily installed. Tops of boxes are easily adjusted.



No. 251-R ADJUSTABLE GANG FLOOR BOX

Similar to No. 130 round cover box, except sides are flat for additional conduit holes. Furnished with No. 208 receptacle and 2" flush brass plugs.

No. 480 "BULLDOG" ARMORED CABLE SUPPORT



Light weight and strong, for supporting or hanging cable from any angle. Easiest, most economical method of temporarily or permanently installing armored cable.

NO. 210 BOX WITH NO 206 STEM NOZZLE

An Underwriters' Approved box, suitable for installation in concrete floors or in wood finished concrete floors. Quickly and easily installed. Tops of boxes are easily adjusted.

To meet the expanding requirements of your buyers, sell the LATROBE LINE... it's complete in every detail, including floor boxes and wiring specialties adapted to commercial, industrial and residential jobs.

Aside from the fact that the LATROBE LINE is complete as to products, there are many other features that make their sale easier. First among these is the time-saving element. Each LATROBE item has been designed to decrease installation time... an important point to stress to contractors. Then, too, each LATROBE Floor Box or Wiring Specialty is flexible as to use ... safe and long-lived in operation, and made of the best materials available.

So, stock the line that saves time ... sell LATROBE wherever quality, useability and economy are the desired features. Write for our price and product list today... also a copy of our distributor plan.

FULLMAN MANUFACTURING CO. QUALITY AT LATROBE OB SUPREMACY LATROBE, PA.

Write for details TODAY!

FULLMAN MANUFACTURING COMPANY
LATROBE • • • • PENNSYLVANIA

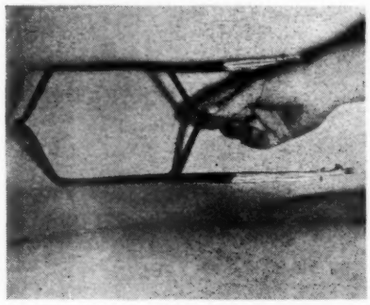
Motor Shops

[FROM PAGE 54]

work rapidly. A $1\frac{3}{4}$-inch armature having 24 coils, 132 turns each of No. 33 wire can be rewound in 20 minutes.

CROSSOVER LOOP

On coils using rectangular conductors, the Dodge Electric Service and Supply Company of Tulsa, Oklahoma, use a winding technique that enlarges



CROSSOVER formed by bushing on winding pin prevents coil cutting adjacent loop.

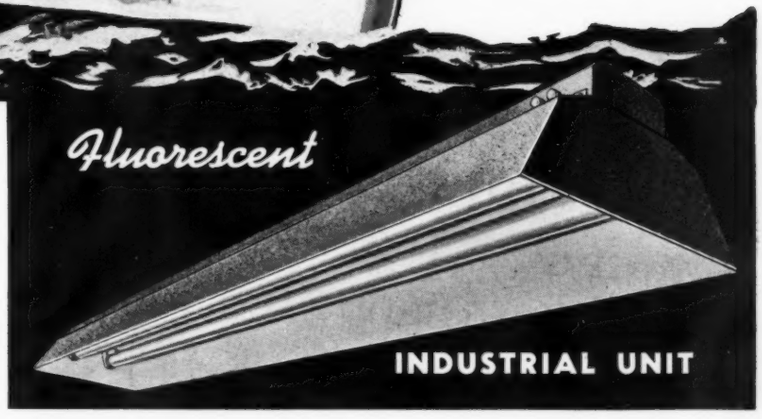
one loop at the twisted outer end of the coil to eliminate the tendency to cut the adjacent coil.

When winding the coil, one loop is run over a bushing on the pin. The radius of the bushing over the pin is equal to the width of the conductor. In pulling the coil, a crossover at the outer end of the loop is formed and both leads come out on one side of the finished coil.

REMOTE CHECK-UP of job progress is facilitated by this Webster Teletalk system at the Electric Motor Repair Co., Trenton, N. J. Communication is between the office and all shop departments. Eliminates writing messages or making personal deliveries and check-ups in the shop.

INDUSTRY RUSHES AHEAD

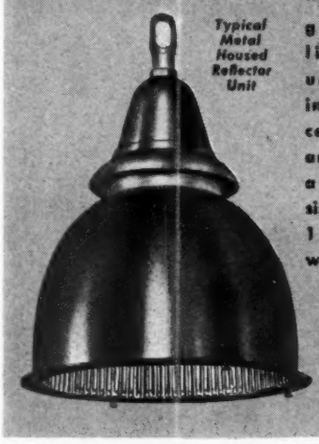
FLUORESCENT AND INCANDESCENT EQUIPMENT AT ITS BEST



Unit illustrated above is a standard Curtis 2-lamp industrial unit. Two sizes: for 2—40-watt or 2—100-watt lamps.

"X-Ray" Incandescent Unit

Recommended for accurate Light Control.



"X-Ray" general lighting units for incandescent lamp are available in sizes up to 1500 watts.

VITAL TO THE WAR EFFORT

Because maximum production is possible only with a well designed high intensity lighting system, good lighting is vital to our war effort.

Curtis lighting equipment is carefully fabricated of quality material to give efficient and dependable service. Conditions in the particular plant will determine what type lighting units will be best. Let our local Curtis representative help you or get in touch with our Chicago Engineering Dept.

CURTIS LIGHTING, INC.

6135 WEST 65TH STREET.... CHICAGO

SOME HOMELY TRUTHS ABOUT

HORSES and HORSEPOWER

Westinghouse Elec. & Mfg. Co.
EAST PITTSBURGH, PA.

THERE ARE HORSES . . . AND HORSES RACING HORSES

RIDING HORSES HEAVY TRUCK HORSES . . . AND BROKEN DOWN HORSES

THAT PULL GARBAGE WAGONS DIFFERENCES IN ELECTRICAL HORSE-

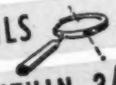
POWER ARE NOT AS OBVIOUS, BUT THEY ARE JUST AS NUMEROUS . . . . SURE,

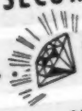
ANY NEW MOTOR OF ANY REPUTABLE MAKE WILL PULL ITS RATED LOAD.

THE QUESTION IS, "HOW LONG WILL IT PULL IT . . ? AND THAT'S THE

KERNEL OF OUR STORY ON WESTINGHOUSE SMALL MOTORS . . . . THEY

STAY NEW LONGER AND THEY STAY NEW LONGER BECAUSE WESTINGHOUSE

PAYS ATTENTION TO SMALL DETAILS  . . FOR EXAMPLE, WE SECURE ABSOLUTE

BEARING CONCENTRICITY WITHIN 3/10,000 OF AN INCH . .  BY DIAMOND

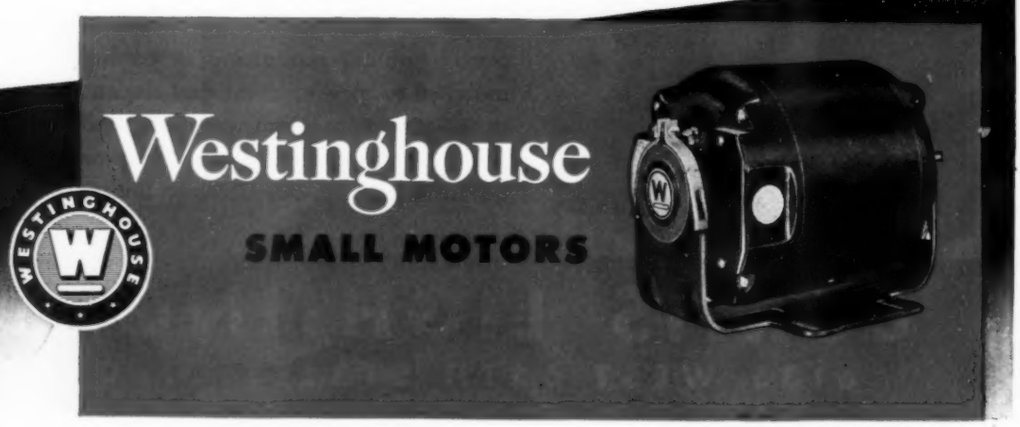
BORING OUR BEARINGS AND MACHINING OUR BRACKET FIT IN A SINGLE

OPERATION . . . SUCH MANUFACTURING PRECISION COSTS YOU NOTHING

EXTRA . . . . . BUT IT PAYS YOU DIVIDENDS IN LONGER LIFE . . . MORE

ECONOMICAL OPERATION . . . FREEDOM FROM REPAIRS.

J-03164



Industrial Electrification

ENGINEERING · INSTALLATION · MAINTENANCE

NO SHUTDOWNS

THE all-out industrial work week, 168 hours long every week, producing an unbroken flow of materials for war is more than a management problem. To those responsible for plant electrical systems, 168-hour operation means new and important problems.

To "keep it running until quitting time" is meaningless when there is no quitting time. Men must be trained in skill and method to handle routine maintenance on live circuits and operating machinery. And an intimate acquaintance with every joint, locknut and contact surface in the system is more essential than ever before.

Added to the records of the plant electrical system, the electrical department must accumulate data on machine operations to spot the routine interruptions in processing so that service work may coincide. Trouble centers must be isolated to make certain that other machines need not be interrupted while repairs are made.

Full schedule operation is the acid test of electrical service facilities in the plant.

Previous articles covered—

1. Simplifying Electrical Maintenance
2. Preventive Maintenance of Distribution Systems
3. Preventive Maintenance of Electrical Equipment
4. Reducing Power Costs
5. Maintaining Good Power Factor—Part I
6. Maintaining Good Power Factor—Part II
7. Meeting Severe Service Conditions
8. Eliminating Causes of Severe Service Conditions
9. Providing Adequate Capacity for Increased Demand
10. Electrifying Operations to Reduce Unit Costs
11. Safety Protection for Electrical Operations
12. Increasing Flexibility of Electrical Service
13. Electrical Aids to Automatic Control
14. Electrical Ways to Reduce Waste
15. How to Save Power
16. Protection Against Sabotage
17. Improving Working Conditions
18. Electrifying for Continuous Operation
19. Electrified Plant Housekeeping
20. Electrical Problems Under 168 Hour Schedules (this issue)

Future articles will discuss—

21. Electrical Aids to Quality Control
22. Electrical Aids to Plant Conversion
23. Factory Codes
24. Welding in Industry

ELECTRICAL PROBLEMS UNDER 168 HOUR SCHEDULES

KEEPING the wheels turning four and one-fifth times the normal number of hours means multiplying the headaches and troubles of the electrical maintenance crew by a number considerably larger than 21 fifths.

Think of a few of the conditions. Wear takes place over four times as rapidly. The amount of oil used is over four times as great. Switch operations occur over four times as frequently. Overheated transformers have no opportunity to cool off. Overloaded motors continue building up temperature. Fuses have no chance to "get back to normal." Hot wires make a continuous oven for the insulation. And with all this, there are no "extra hours" in which to make normal repairs or replacements.

Under the conditions as outlined, the ordinary concept of the electrical maintenance crew as a "repair gang" must be revised. Repair work must now be done before the breakdown. Reinforcing must be completed before the fuses blow. New work must be scheduled, not used as a fill-in between emergency jobs. In a word, "Preventive Maintenance," planned maintenance based upon a knowledge of plant conditions, must be employed.

How can production be sustained when machines are allowed to break down? Of course more men will be needed. However, with preventive maintenance, one extra maintenance man might keep a hundred production men from being idle due to machine stoppage from electrical breakdowns.

A thorough knowledge of electrical conditions should account for three essentials on each item surveyed: 1—The nominal or theoretical capacity of that unit; 2—The condition of that unit; 3—The actual load on that unit. None of these bits of knowledge become usable data until they have been recorded for reference.

Check up for clews to trouble

The survey should cover the supply, the distribution, and the utilization equipment in the power system. Taking them in the order of their importance, the Power Company connection, or the generators, should receive first attention. Next in importance are the main distribution feeders, then the lines supplying essential services and the units operating those necessary services. Following these will come the sub-feeders and the equipment operating from them.

The Power Company can furnish information quickly regarding the total capacity that its connection can serve. For most plants, the factors limiting purchased capacity are the service

GOOD LIGHTING and efficient electrified handling are essential for any plan for sustained 168 hour output.

switch and the amount of copper in the service connection. If power is generated, the name-plate rating of the generating units will indicate the upper limits of their ampere carrying capacity.

If power is distributed at higher than utilization voltages, the name-plate rating of each transformer should be noted, including any taps for voltage correction. Also a record should be made of the way the transformers are banked together electrically.

Wire and switch sizes on main and sub-feeders in ampere carrying capacity should be established. A knowledge of available spare capacity may permit the addition or transfer of much load without extensive wiring changes.

Each electrical unit should be carefully examined, for its capacity may be seriously reduced if it is in bad condition. A generator or motor with cut out coils cannot give the same service or efficiency as will a new one of the same name-plate rating. Switches or fuse clips which have been subjected to severe overheating will not carry the same load as new ones with the same rating. Wires with baked or charred insulation will not stand the same voltage surge that new ones will take. All such conditions should be carefully noted.

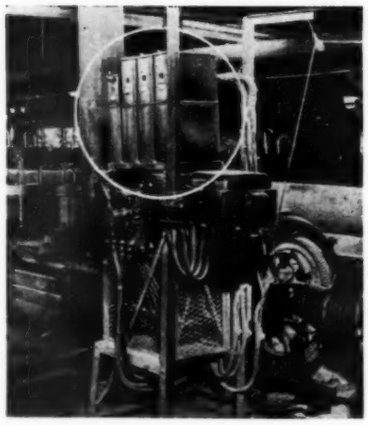
After the capacity and condition of the electrical plant has been established, the next step is to determine the load on each of its parts. Recording ammeters would, of course, be the ideal method. However, spot checks with split-core indicating ammeters at the time of peak load will usually serve as an adequate guide in establishing load conditions.

What kind of load?

The character of the load is important. For example, the peak demand on a punchpress motor and the peak demand on a fan motor are entirely different in their effect upon the supply equipment. Pulsating or intermittent loads of short duration have little heating effect, whereas a steady load, such as a fan, gives the equipment no opportunity to cool off. The indicating ammeter, over a short period of time, will demonstrate the type of load being studied.

Ammeters are suggested for measuring the load, for electrical equipment rating is based upon ampere carrying capacity. This condition makes it necessary that the power factor of the various loads be known. Motors and other equipment having low power factor easily may be, and very frequently are, the cause of overloaded wires and transformers.

The ability and opportunity to dissipate heat will determine very largely the amount of load an electrical unit can carry. This is why certain equipment may be stated as having 100 percent overload capacity for thirty minutes and 10 per cent overload capacity continuously. A plant running eight hours daily may operate its transformers close to capacity for much of the working time, with occassional periods of one or two hours at 120 percent of load. This appears to have little detrimental effect upon the transformers, for during 16 hours each day there is little load and the equipment can cool down.



***CAPACITOR BANK** (circle) brings power factor of drive of this continuous wire-drawing machine practically to unity. With power factor corrected it was possible to maintain 600-hp. additional load on a seemingly overloaded system without extra wirings or transformers.*

Such a condition cannot be accepted on 168 hour schedules, for no opportunity is given for cooling. Continuous overload serves only to raise the temperature progessively until the insulation eventually breaks down and the transformer burns out. The same conditions apply to motors and other units normally operating at capacity or slightly above, but with occassional extreme overloads. When the heat cannot be dissipated, these repeated short-term overloads will injure the windings.

Actually the situation is even worse than this. A 168-hour working schedule presupposes production under pressure. Maximum operations will be carried on continuously. Under such circumstances, each machine will produce more steadily, operating cycles will be shortened, a greater percentage of available machines will be running, more air will be used, more water will be pumped, and more lights will be burned. It all adds up to consistent demands possibly 20 per cent greater than with normal "full-production" on a 40-hour schedule.

This, then, explains why the troubles of the electrical maintenance crew multiply at a faster rate than do the working hours of the plant. The picture as painted is rather gloomy, but not cheerless.

Having surveyed the plant, existing conditions may be studied and plans made accordingly. Ordinary inspections will be made more frequently and more thoroughly. Oiling and inspection, if necessary once daily with eight hour operation, now will be needed three times daily, seven days each week. Transformers, motors, and switches must be checked more frequently against overheating, for they will have no "off-hours." All evidences of deterioration must be noted and reported so that replacements may forestall breakdowns. Conditions which are known to be bad must be watched more carefully until corrections can be made. These duties may be termed the routine of planned maintenance.

The first care must be to insure that no condition inside the plant causes an interruption to the main source of power. Assuming that the main service and switch is large enough for the regular load, a control should be set up so that no temporary overload will trip the main breaker. There are at least two comparatively simple ways that this may be accomplished.

Tackling trouble at its source

The function of the fuse or overload relay on the main switch is primarily to isolate any faults on the load side from the supply on the line side, to protect the supply line from short-circuits on the load side of the switch, and secondarily to protect against excessive loads from equipment operating normally. This protection must be retained. A second relay may be added, however, with a setting somewhat below that of the main relay, which will trip certain unimportant units, or sound a warning, when the total load approaches a magnitude which would open the main breaker. Such loads as water pumps discharging into a reservoir can be dropped for short periods without hindering plant production in the least. This method may be extended progressively as warranted.

An electric eye, directed upon the pen or pointer of a demand meter, can be used in the same way as the second relay to drop unimportant units when overloads threaten.

All fuses and relays on the main panelboard should be set in close relation to the loads carried by the main feeders. Overloads on these lines should be interrupted by the feeder breakers so that excessive load swings may not disrupt total service to the plant.

When transformers are found to be somewhat overloaded, fans may be employed to dissipate the heat more rapidly. If the overload is very great, this method should not be adopted permanently until the manufacturer has been

MAINTENANCE GUIDE SHEET

ELECTRICAL PROBLEMS UNDER 168 HOUR SCHEDULES

Check Sheet

TROUBLES	PROBABLE CAUSE	CORRECTION
Overheated Motors	Overload from production speed-up	Replace with larger motors or divide load
	Increased friction	Inspect and oil more frequently
	Continuous use with no idle hours	Use larger motors or ones with more suitable characteristics
	Low voltage due to larger line loss from increased loads	Improve power-factor to reduce amperes Increase feeder size
Overloaded Circuits	Overload from production speed-up	Create "Ring-bus" Divide load with other feeders
	Low power-factor	Use capacitors on motors or other units Replace with smaller motors or others more suited to conditions Connect capacitors at sub-feeder panels
	Low voltage from overloaded transformers	Correct power-factor Increase transformer capacity Transform to operate circuit at higher voltage Relocate transformers to shorten runs
Overheated Switches, Panels and Fuses	Copper annealed	Replace with copper in good condition
	Bad contacts	Inspect and clean more frequently
	Continuous load	Increase ventilation Relocate if surrounding air is hot
	Low voltage from overloaded transformers	Correct power-factor Increase transformer capacity
	Overload from production speed-up	Enlarge capacity Divide load better

TROUBLES	PROBABLE CAUSE	CORRECTION
Overheated Transformers	Low power-factor	Improve load by capacitors located anywhere on load side—should be at motor terminals or sub-feeder panels
	Poor ventilation	Use fans to increase air circulation In vault—provide more air openings
	Poor oil circulation	Replace or filter oil Make sure oil openings in coils are clear
	Overload	Improve power-factor Decrease transformer load by making large units operate at high voltage Relocate transformers closer to load center to decrease line losses
Plant Shutdowns from Main Breaker Operations	Load too close to relay setting	Reset relays to higher capacity if equipment is large enough
	Short overloads	Install relays to drop unimportant load Increase time of delay if permissible Re-schedule if cause of short overload is known
	Overload	Improve power-factor Reduce load by installing separate breaker for essential loads Correct local heating conditions which waste power
Any Failure Due To Lack of Attention	Insufficient help	Adopt preventive maintenance Schedule inspections more frequently Make inspection a separate responsibility
	Impaired attention due to excessive overtime	Increase maintenance force Make record of bad conditions to insure frequent inspection

More bombers will roll off the "line" tonight!

VITAL machinery hums on as night is turned into day for the thousands of workers in busy aircraft factories. There must be no failure of power or light — planes must constantly roll off the line — today, tonight, tomorrow.

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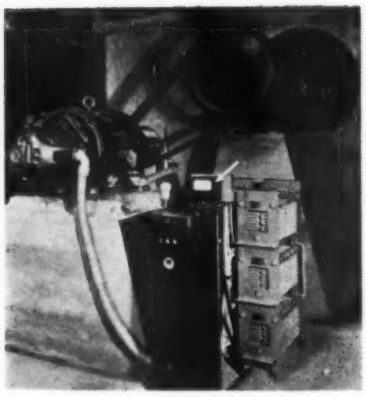


***INDICATING AMMETER** "feels the pulse" to show operating condition of this 60-hp. wound-rotor drive on a centrifugal blower that removes hot air from a drying kiln.*

consulted. Fans, when properly applied, usually will increase the transformer rating about thirty percent.

If large ampere loads are the result of low plant power factor, the current should be reduced by power factor correction at the source rather than try to increase copper and transformer capacity by adding ventilation. Improvement of power factor at the source has the further important advantage of releasing current carrying capacity throughout the entire electrical system. It also will reduce the voltage drop in the lines, thereby permitting motors to run cooler and at somewhat higher speeds, for the slippage will be less. This correction probably can be applied best by the use of capacitors at the motor terminals or at the sub-feeder panels.

Coddling the essential unit

Maintenance of dependable service to essential units may require special treatment. If there is not a separate and independent line from the main power panel to each unit, it may be desirable to put one in. If the unit is of such character that it should run even though the main switch trips on overload, it is possible, under present code provisions, to have a separate switch installed for that unit. In any event, these essential units should be investigated to establish that their power supply is from feeders and sub-feeders not likely to be interrupted by other overload; that the switches, fuses, fuse clips, and connections are in good condition; and that there are a minimum number of splices in the lines.

If two circuits supply the load in a given area, their effective capacity may be increased by tying them together into a "ring-bus." When operated in this manner, the load will be more evenly distributed, and voltage at the various taps off this bus will be more nearly uniform than when the two serve as radial feeders only. More capacity can be added economically by another feeder tapping a different point on the loop.

Repairs and replacements which have been found necessary should be so organized that the work may be done whenever a unit can be taken out of service. Although 168 hour schedules cannot be maintained on each unit if shutdowns occur, there will be certain times, nevertheless, when the unit is idle for lack of material, labor shortage, or stoppage for other reasons.

Right here we come to the 20 and 1 idea. Twenty shifts for production; one shift for maintenance. This is standard practice for many plants which operate 168 hours a week. It permits regular essential electrical maintenance without idle machine time being charged to the electrical department.

Repairs on "hot" lines

However there will be instances when doing repair jobs with the lines "hot" will be almost compulsory. On open wiring, this can be done quite extensively with almost complete safety if proper tools, equipment, and training are provided. Rubber gloves and safety mats, frequently tested, should be used in all cases, including work on low voltage lines. Insulated tools should be furnished so that total dependence is not placed upon the rubber equipment. Sets of leads or jumpers of various lengths and capacity with connectors of a type easily applied or removed should be available. Training should include, as a minimum, the safe way of handling the tools and the dangers of electrical shock from even low voltage lines.

It is doubtful whether emergency repairs can be completely eliminated, but their consequences can be minimized if plans are made to handle them quickly. With a knowledge of capacities, condition, and type of load on the various parts of the electrical system, electrical men should know where trouble can be expected. If the doubtful item is a disconnecting switch or a fuse block, a temporary switch with leads attached should be prepared in the electrical shop. When the emergency occurs, this temporary connection can be installed quickly to by-pass the trouble and keep the machine operating while permanent repairs are being made. Similar set-ups can be prepared for most of the danger spots. Since many cases will follow the same pattern, the total number of prepared set-ups will not be too great.

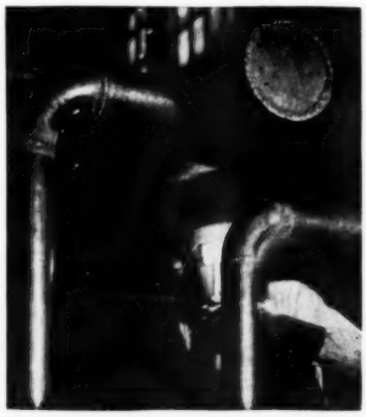
For some items of the electrical system, having spare units on hand will be the only way to restore service quickly. A transformer, for example, is difficult to get "off the shelf." This is particularly true if there is anything off-standard about the installation. A spare unit should be on the mat, preferably with leads attached or made up so that it may be cut-in quickly to replace the damaged one. Where essential services are driven by special motors, spare units should be on hand.

Organization

Without preventive maintenance, the crew must either be enlarged in a ratio greater than the increase in hours, or the men must put in more hours of overtime work.

If preventive maintenance is practiced, it should be possible to retain only skeleton crews during all hours except the normal 40 per week. These skeleton crews perform the routine duties of oiling, replacing bulbs or fuses, and minor repairing as needed. They should inspect and report on such items as may be more conveniently examined during their shift. Working schedules should be adapted to their convenience, if possible, or rotated according to the plan which probably has been adopted for the rest of the plant. The larger number of the maintenance crew will then work during normal hours, when scheduled repairs and replacements may be made. This has the further advantage of having the responsible supervisors present while major assignments are being carried out. For possible emergency work at other hours, the day crew may be divided into groups, some to be on call, and others free.

With all its troubles, the 168 hour schedule may actually prove a blessing to the plant, its maintenance force and its management. Compulsory rehabilitation will have replaced defective parts. The plant will be released from continuous production in better condition than when it started.



***ELECTRIC WELDING** can often do repair jobs in an hour, whereas waiting for new equipment or parts might shut down vital production areas and machines for weeks.*

War Industries
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CENTURY
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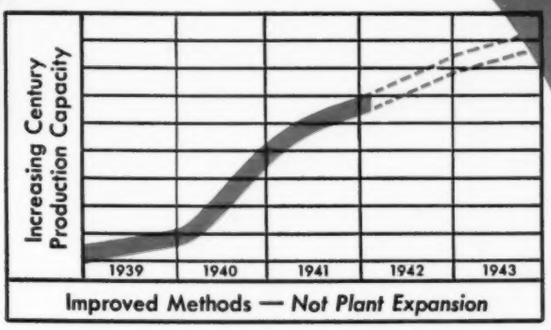

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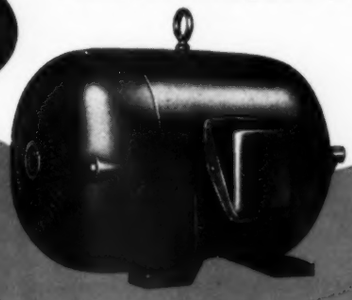

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Give your "Inch-Marked" ELECTRUNITE STEEL-TUBES Distributor a chance to help you solve your electrical supplies problem. He's anxious to serve you—and can, in many ways. He may not be able to give you all the raceway, fittings, wire, fixtures and other materials that you would like, but he'll never stop trying.

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He probably is able to furnish you from stock with the materials needed for small jobs. Or enough to begin work immediately on the electrical installa-tion for an armament plant or other essential proj-ect. If he can't, he'll go the limit to get them for you. He may be able to help you "lay out" the job and arrange schedules to keep it moving on time. He just never lets up in his effort to help you.

And you can help him, too—by *always* giving com-plete data on your preference rating extension with *every order.* In this way you enable your distributor to replace material furnished you from stock—you make it possible for the manufacturer to secure raw material to make the additional products you will need for Construction for Victory.

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He'll gladly show you this streamlined rigid steel raceway—the "inch-marking" that provides a continuous foot-rule on every length—the knurled inside surface that reduces wire pulling effort—the two simple fittings that end thread cutting—the ELECTRUNITE Bender that makes bends more accurately and easily than ever before—the helpful bending instruction tag—and the many other features that make this conduit the "easiest-to-use rigid steel raceway in the world."

REPUBLIC STEEL CONSTRUCTION FOR VICTORY

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A CONTINUOUS FOOT-RULE ON EVERY LENGTH!

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Fig. 950 Lead Type

Fig. 955 Fiber Type

Fig. 950—Lead Woodscrew Anchor
Fig. 955—Fiber Woodscrew Anchor

We can also furnish Lead Expansion Anchors—nut and bolt or machine screw type—Malleable Expansion Shields and Spring Wing Toggle Bolts.

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ELECTRIC HEAT *maintains closely regulated temperatures and eliminates excess heat and fuel gases on these plating baths.*

Electric Heat Used for Plating Plant Baths

Objectionable odors arising from burned fuel and excess heat for employees was eliminated when electric heat replaced gas fired plating baths in a Pacific coast plant.

Caustic-soda and water-rinse baths are placed side by side and surrounded with 3-in. of vermiculite which is held in place by corrugated iron.

Normally, temperature is maintained near 200 deg. F. Each bath is heated with three 4-kw. immersion heaters located at the bottom of the tanks. The heating units are connected to 230-volt 3-phase service. A thermostat is located in the rinse tank and controls all units through a magnetic switch.

To reduce losses, a heat-insulating cover is put over the tank at right. A time switch is used to return the tank to operating temperature by working time.

Electric Drive Increases Flexibility

The Berst, Forster, and Dixfield Company of Plattsburgh, N. Y. recently installed a new paper-making machine for the manufacturing of crepe tissue or towel as well as flat paper for waxing. Powered by a G. E. electric drive the machine is 177 inches wide and has a maximum operating speed of 1,500 feet per minute. Operated continuously for 24 hours, a sheet of paper 14 feet wide and 400 miles long can be made.

On the wet-end section of the machine, helper motors operate the couch and press sections. The helper motors maintain constant tension in the pick-up felt at all times. Speed of the entire wet-end section, is maintained constant by means of a speed regulator.

The dry-end section of the machine is also furnished with a separate drive. The relative speed of the wet- and dry-end sections is maintained constant by a modified speed regulator.

A high degree of smoothness in the acceleration and operation of the machine is obtained by the use of two separate generators, driven by a single synchronous motor. Thus the starting, stopping, or operating of either end of the machine is independent of the other,

***MAIN CONTROL BOARD** of drive on paper making machine. In background are G.E. wet-end motor drive and motor generator set.*

without requiring the many accelerating devices previously used for such machines. Separate and individual motors are furnished for the spread rolls and crepe rolls, to provide ease in handling, and close adjustment of the speed of these sections.

The control equipment used on the machine provides for ready inspection of the load on individual sections, and provides the operators with knowledge of machine conditions during operation.

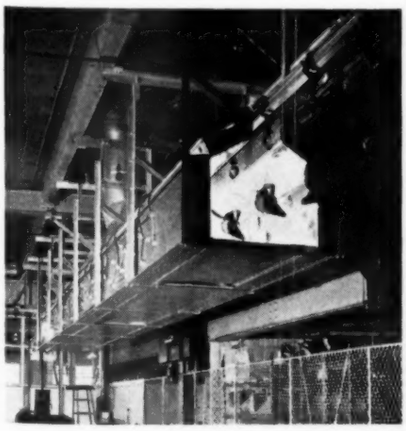
The control system is so arranged that the machine can be operated to give as much as 35 per cent crepe, or operated with the dry end running slightly faster than the wet end for flat paper.

Overhead Infra-Red Drying Tunnel

Much ingenuity can be used in designing a drying lamp installation to best suit the product. Where several sizes or types of articles must be treated, successful results have been obtained by using one tunnel with adjustments and special holders or "trees."

Some tunnels are like inverted U's in cross section while others consist of two flat banks facing each other. In these types there is no possibility of paint dripping on bottom lamps and reflectors. And there are fewer reflectors directly above the work on which vaporized paint can condense and bake.

In the illustrated installation at the Apex Electrical Manufacturing Co., Cleveland, plastic steel, cast iron and cast aluminum parts are all baked in one tunnel which contains two hundred 250-watt reflector drying lamps. The autotransformer in the background provides 125 variations in heat control so all finishes can be dried in the same tunnel. Drying time has been reduced 85 per cent, while the saving in floor space is obvious.



OUT OF THE WAY tunnel of infra-red drying lamps speeds up production and saves valuable floor space in this electrical manufacturing plant.

And there's just as much difference between the *streamlined* BRIEGEL METHOD of making connections and former old-fashioned methods.

The BRIEGEL METHOD saves you up to 50% on time and a substantial saving on materials allowing you a larger margin of profit on each job. Make quick, easy, strong and neat connections this MODERN way.

No extra turns or twists, no nuts to tighten when you use B-M connectors and couplings. Just TWO SQUEEZES with the patented B-M indenter (which costs you only $1.25) and you have a smooth efficient job. Approved by Underwriters Laboratories.

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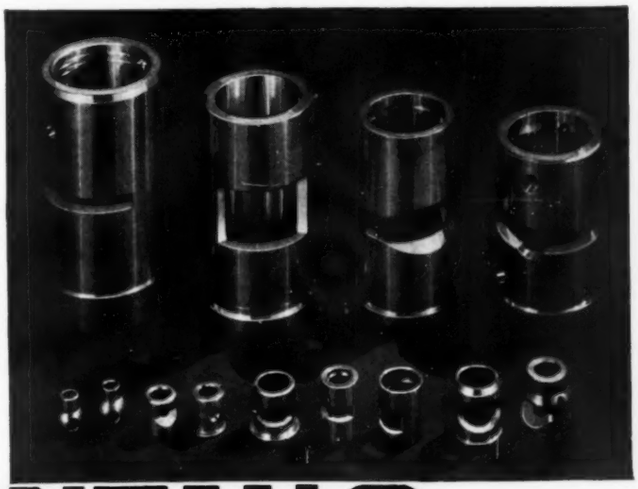

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Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay $5.00.

CHLORINE ATMOSPHERE

QUESTION 39. What will protect a commutator from a chlorine atmosphere?—L.W.B.

A. TO QUESTION 39. Where the copper does not have to form an electrical contact, it may be protected with one of the plastic varnishes.

However, most plants having a chlorine atmosphere, have compressed air available. It is then possible to form a guard at the bell of the motor and introduce into this guard a small stream of air. The ventilating air for the motor is drawn at the ends of the rotor shaft. This supply of air must be left available. The object of the guard is to furnish a small supply of chlorine free air to the area around the commutator by keeping a small stream of air going to the guard. Thus a clean air condition is maintained at the commutator.

This method of control has worked successfully in several cases. It may be adapted to any corrosive atmosphere. —J.P.S.

A. TO QUESTION 39. Studies have been made in plants where corrosive gas attacks the commutator and the copper shunts of the brushes.

This commutator condition was corrected by installing brushes of sufficient polishing or abrasive action to remove the chemical attack at as fast a rate as it developed thus keeping a smooth, nicely colored commutator.

The corrosive effect on the copper shunts was arrested by the use of tinned shunts. These are available on brushes at no extra cost.

The equipment manufacturer should be able to furnish the right type of brush to produce the correct amount of polishing action. Some experimentation may be necessary to obtain the proper grade of brush as the corrosive action varies with the temperature of the commutator surface and the volume of contaminated air drawn in by self ventilation.—R.C.M.

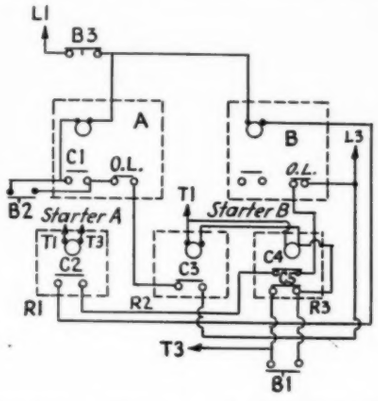
A. TO QUESTION 39. Commutators used in applications where chlorine fumes are present may be protected from corrosion by applying a very thin coat of paraffin. The supply of this protective film on the commutator surface may be made uniform by filling the undercut slits between segments with paraffin. The slits may easily be filled by pressing paraffin on the commutator while rotating. The commutator surface should be wiped clean before each application of paraffin.—R.G.C.

STARTING TWO MOTORS

QUESTION 40. A machine for cutting the thread on large feed screws has two induction motors, a 1 hp. and a 1½ hp. To avoid any chance of error by the operator, they desire to stop and start both motors from one station so connected that motor A starts first and motor B stops first. In stopping, both motors have about the same amount of drift and the use of brakes is not desirable. What sort of starting and stopping devices will this job require?—J.J.L.

A. TO QUESTION 40. The equipment is noted as follows: A—starter for motor A. B—starter for motor B, R1—delayed action relay with normally open contacts; R2—delayed action relay with normally closed contacts; R3—standard relay with one normally open and one normally closed contact; B1—normally open stop button; B2—normally open start button; B3—normally closed emergency stop button.

The operating sequence is as follows: When button B2 is pushed starter A closes starting motor A, R1 is connected to the load side of starter A so when A closes R1 starts to operate. After the time setting elapses, contacts C2 close and causes starter B to close and start motor B. This gives the desired starting sequence. To stop the machine the reverse sequence is desired, so by



pushing button B1, R3 is energized which causes contacts C4 to open which in turn causes starter B to open stopping motor B. At the same time C4 opens, C5 closes and causes relay R2 to start operating and after the desired time elapses, contacts C3 open and cause starter A to open stopping motor A. When starter A opens, all the relays instantly reset for the next operation, button B3 is for emergency only, B1 is not an instantaneous stop due to the delayed action of the relays, and in case of an accident B3 may be used to release all the controls at once.

The delayed action relays may be obtained in the dashpot type or the motor driven type. You will note that all relays are connected to the load side of starter A. This is necessary in order for the relays to reset after each operation.—C.E.S.

A. TO QUESTION 40. While J.J.L. does not state whether the motors to be controlled are single or three phase, he could use a rotating cam reversing switch for either. This switch has five single pole contacts that close in the forward direction. Two forward contacts should be used to control each motor. The stationary contact nuts used to control motor A should be removed and a ⅛-in. washer placed beneath the contact nuts. This will reduce the travel of the movable contacts used to start motor A causing it to start first. The contacts used to control

Quicker easier threading of Conduit with this RIGID No. OOR

For instance, fast change of die heads: in No. OOR they lock in or release by pull of ratchet knob; in Nos. OR and 11R they push out easily, snap in from either side, but can't fall out. No bother with special dies for close-to-wall threads: regular ⅛" to 1¼" tool steel dies reverse easily; are quickly removed for regrinding, cut smooth accurate threads. Rugged all-steel and malleable-alloy tools, extra long service, a pleasure to use. Conduit or pipe dies, handy carrier with complete sets—no extra cost. Try them at your Supply House.

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Same speedy convenience as small ratchet threaders described above—dies reverse for close-to-wall threads, remove easily for regrinding.... No. 30A threads ⅜", ½", ¾"; No. 31A, ½", ¾" and 1".

....You will like this handier, more efficient RIGID Pipe Vise

Like all RIGID Tools, this bench yoke vise gives you a lot more in service and convenience than mere pipe holding. LonGrip jaws protect pipe or conduit grip more firmly for easier work, aided by the built-in pipe support. There's a handy pipe bender. Frame is of strong special malleable metal, jaws of highest quality tool steel, scientifically hardened for firm grip and long wear. Full line of bench, post, kit and stand vises, yoke and chain patterns, all with work-saving features. See them at your supply House.

UNCONDITIONAL GUARANTEE
If this Housing ever Breaks or Distorts we will replace it Free.
THE RIDGE TOOL CO.
ELYRIA, O.
RIGID

RIGID Guaranteed Pipe Wrench

No housing repairs—it stays on the job—saves you time and money. Powerful I-beam handle, chrome molybdenum jaws. 6" to 60".

All RIGID Pipe Tools are sold only through Supply Houses

RIGID

THE RIDGE TOOL COMPANY
ELYRIA, OHIO, U.S.A.

Pipe Wrenches, Cutters, Threaders, Vises

Work-Saver Tools for America's Big Job in 1942

JOHNSON BRONZE

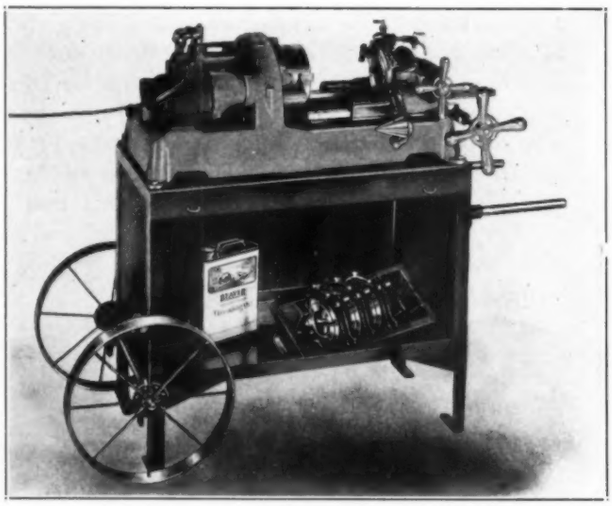
SLEEVE TYPE BEARINGS

How to make Good Motors BETTER

NEW
Catalogue
Lists and describes the most complete stock bearing service available. Write for your free copy.

It makes little difference whether you are buying, building or repairing motors, JOHNSON BRONZE can help you. In new equipment we can help you design the *type* of bearing that will guarantee the most efficient operation. For replacements, we offer you the largest range of sizes and types in bearings available. In order to get the most from your motors —consult with JOHNSON BRONZE. Let us help you make good motors *BETTER.*

JOHNSON BRONZE
Sleeve BEARING HEADQUARTERS
490 S. MILL STREET · NEW CASTLE, PA.



highly efficient
low priced
portable
powerful
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Beaver Model-B
⅛ to 2-inch Pipe and Bolt Machine

For ⅛ to 2-inch pipe—¼ to 1½-inch bolts. Up to 8-inch with drive shaft and geared tools. Rack-and-pinion feed. Cast steel-iron base and cap. All-steel geared universal pipe chuck—with safety automatic wrench ejector; hinged full-range reamer; sliding wheel or knife cutoff; ring-type opening adjustable diehead—no hinge. Automatic gear-driven oil pump. All gears enclosed and run in oil. Choice of 110 or 220 volt universal reversible motor. Weighs about 280 lbs. In use in finest pipe shops throughout the country.
Write for Bulletin B.

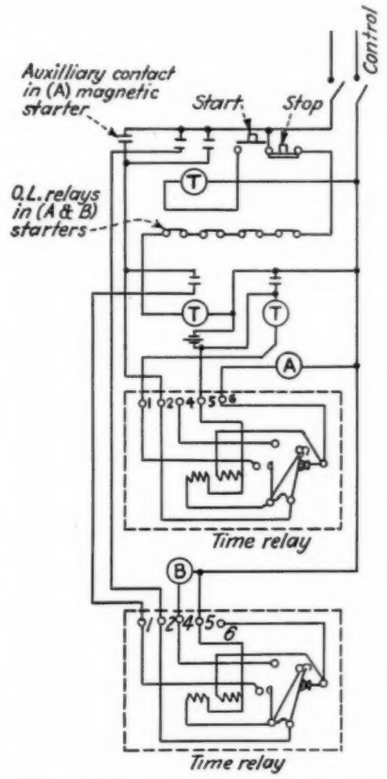
BEAVER PIPE TOOLS
Highest Quality • WARREN, OHIO • For 40 Years
342 DEEN AVENUE

Reader's QUIZ

[FROM PAGE 70]

motor B should be left in their original position, which will cause motor B to stop first.—B.C.M.

A. TO QUESTION 40. The starting and stopping sequence of these motors can be accomplished with two time delay relays and three transfer relays, as shown in the accompanying diagram.



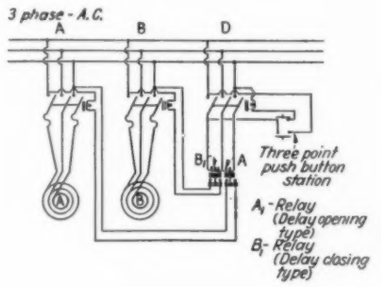
Coils marked A and B are the operating coils for the magnetic starters. Coils marked T are transfer relay coils. All contact positions are shown with the operating coils de-energized. The time delay may be adjustable over a wide range.—L.H.M.

A. TO QUESTION 40. The devices necessary for this job are two automatic starters, one automatic contactor, a three-point push button station and two relays (one a delay opening type, the other a delay closing type).

If the controls are hooked up according to the diagram shown, the sequence of operation will be as follows: When the start button is pushed, contactor "D" would close. This would cause relay A-1 to contact thereby completing control circuit of starter A. B would fol-

low a similar sequence, but at a delayed moment (time of which can be controlled) caused by the action of the relay B1.

In stopping, the above sequence is followed, but in reverse, relay A1 causing a delay in opening of starter A.



RUSTED SHAFTS

QUESTION 41. In our plant there are some 2,000 motors driving individual or small groups of machines which often require changes in pulleys and gearing. It is difficult to remove gears and pulleys from the shafting of the motor and machine because they are rusted fast to the shafting. Gears, pulleys and shafting are cleaned to a bright finish and oiled and then assembled, but they rust fast to each other. We then tried grease but the rust still persisted. What causes it and is there a remedy? —J.J.M.

A. TO QUESTION 41. Rusting together of gears and shaft when grease or oil is applied indicates a lubricant containing free acid is being used. This may be an inferior lubricant purchased on a price basis. The savings, however, are usually more than lost due to increased maintenance costs.

Instead of oil or grease, I prefer white lead cut with about SAE-20 lubricating oil to a consistency which can be applied easily with a brush. The shaft is painted with this white lead before pressing the gear in place. The white lead prevents galling while the gear is being pressed on the shaft and seals the space between the gear and shaft to prevent entrance of moisture or corrosive atmosphere.

Where the fit may be subjected to high temperatures such as might occur to a brake drum, a coating of graphite and oil is preferred to white lead.—G.I.S.

A. TO QUESTION 41. This condition is a chemical reaction of the atmosphere and the characteristics of the steel in the shafts, pulleys and gears. It is difficult to eliminate but may be delayed.

Sperm oil will delay the chemical

T&B

THOMAS & BETTS

INSULATE THEIR

"STA-KON" TERMINALS and "WEDGE-ON" LUGS

WITH

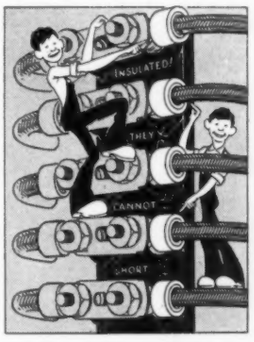
IRVINGTON PLASTIC TUBING

In featuring the use of IRV-O-LITE XTE-30 Extruded Plastic Tubing in their catalog, Thomas & Betts give the descriptions shown in the two excerpts below.

"Insulating sleeves are available to prevent shorts between adjacent lugs or metal parts. Put the insulator on the wire first. After the 'Sta-Kon' has been installed, just push the insulator on over the barrel of the terminal."

"These 'Wedge-On' Lugs are complete with insulating skirts encasing the lug body to prevent accidental shorts. This insulating skirt overhangs the end of the lug body, assuring full protection. It is flexible and therefore not marred by the tool in installing. It will not crack or split under abuse, and will not swell, loosen or distort due to moisture.

"Tensile strength: 2150 lbs. per square inch. Dielectric strength: dry, 732 volts per mil; wet, 310 volts per mil. Moisture absorption after 24 hours immersion, .94%. Temperature limit: 300° F, starts to soften. It is resistant to transformer oils, solvents, sulfuric acid, caustic soda, etc."



IRV-O-LITE XTE-30 Tubing has high dielectric and mechanical strength with exceptional resistance to tearing, abrasion, heat and solvents. Its flexibility, smoothness, continuous lengths and wide range of colors help speed assembly.

Send for test sample and prices— write Dept. 96.

PROMPT DELIVERY ASSURED

Irvington VARNISH & INSULATOR CO.

IRVINGTON, NEW JERSEY, U. S. A.

PLANTS AT IRVINGTON, N. J. and HAMILTON, ONT., CAN.
Representatives in 20 Principal Cities

"Gorilla Grip" Mechanical Connectors may be quickly adapted to meet unusual requirements. Every day new "Gorilla Grip" combinations are being discovered to meet critical situations. Make-shifts are not necessary. The Terminal Units are minutely machined to fit just one conductor size, however, one Terminal Unit will precisely fit nineteen various types of lugs, taps and connector bodies. These connector bodies will take as high as nineteen different Terminal Units or wire sizes.

A "Gorilla Grip" stock set assembled for your particular need is good insurance against electrical connector breakdowns. Ask for literature.

National Electric
PRODUCTS CORPORATION
1000 FULTON BUILDING, PITTSBURGH, PA.

Reader's QUIZ

[FROM PAGE 73]

action for a considerable period. A coating of white lead applied on the shaft will delay it much longer. However, from observation, the most important factor in delaying the chemical action sometimes for years, is to have a correctly machined shaft, gear, pulley, coupling, etc. They must be properly fitted. Heat should be applied to pulley, gear, or coupling before installation. The size of the units determines the tolerance.—O.A.

Can You ANSWER *these* QUESTIONS?

QUESTION VI.—We have a problem of removing old wires from conduits to permit rewiring and clearing a number of short circuits. Condensation has moistened and rotted the insulation so that we cannot pull out the old conductors. If you have had a similar experience, we would appreciate some suggestions on how the wires may be withdrawn.—E.F.

QUESTION WI.—We have a 100 kva. and 150 kva., 3 phase, 480-volt, 30 cycle generator, each directly connected to a 480-volt, 3 phase, 60 cycle synchronous motor. So far only one machine was run at a time to supply a 30 cycle bus but an increase in load makes it necessary to run both together. Could these generators be synchronized or would it be necessary to change the drive on one of them?—J.J.L.

QUESTION XI.—In a 40-watt fluorescent lamp on a 220-volt, 60 cycle circuit, a band of light revolves corkscrew fashion in the tube. When reversed end for end this is cleared up until the lamp is turned off and relighted. What is the cause and how can I cure this phenomenon?—S.C.

QUESTION YI.—On a direct current generator the brushes are arcing very badly, causing the commutating surface to become flat. These bars, where the flat spots show, are burned. This generator apparently has been rewound as the specifications do not agree with the manufacturer. The present nameplate data is compound wound, 125 volts, kw. 10, rpm 1150, amperes 80. The original should have read shunt wound, 115 volts, 78.5 amperes, 4 pole. What is the remedy?—D.J.F.

PLEASE SEND IN YOUR ANSWERS BY APRIL 1

For Better Service—
INSTALL **TRICO** REG. U.S. PAT. OFF.

RENEWABLE FUSES
With the famous Powder-Packed Element

KLIPLOK CLAMPS
Lock fuses and clips together

KANTARK FUSES
With genuine fibre tubes (not paper)

COLORTOP PLUG FUSES
The color tells the size

FUSE PULLERS
Pull and replace fuses safely

OILERS
Glass and Unbreakable types for every application. Stops guesswork - bearing failures - waste - idle machinery, etc.

WRITE FOR FOLDER No. 300

TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

DRILL HOLES *in* CONCRETE THIS *Easy* WAY

50% to 75% FASTER THAN ORDINARY DRILLS

Throw away your hammer and star drill! No more long tiresome hours of costly chiseling in concrete! Carboloy Masonry Drills zip through concrete, tile, porcelain, brick, 50% to 75% faster than ordinary drills. And they stay sharp up to 50 times longer, because they're tipped with Carboloy . . . a metal approaching the diamond itself in hardness. Drill more accurate holes too! Easier to install expansion anchors.

Try Carboloy Drill-Points in any rotary drill (or hand brace) and you'll never go back to old methods. Send for leaflet.

CARBOLOY CO., INC.
11135 E. Eight Mile Road, Detroit, Mich.

SEND FOR FREE LEAFLET

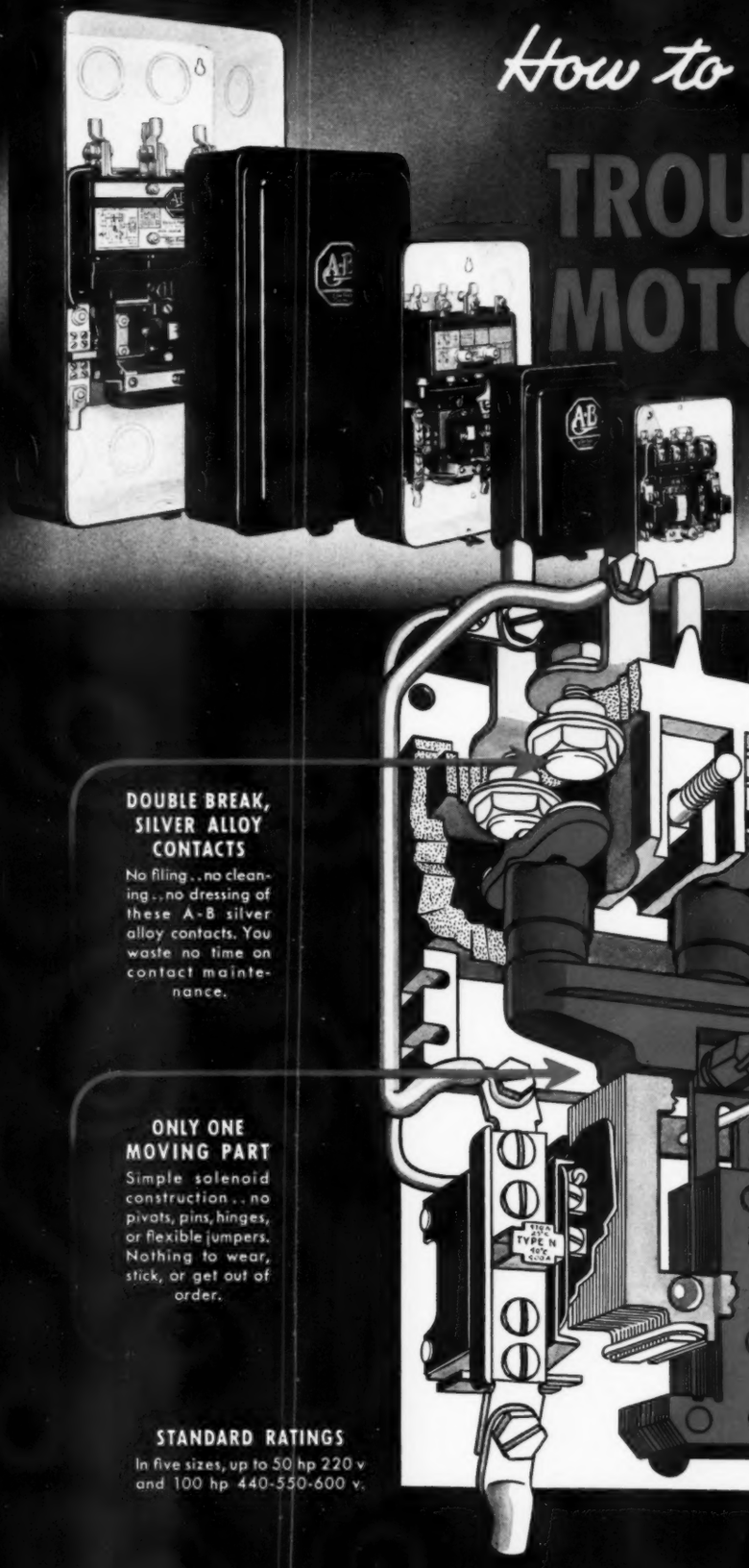
CARBOLOY
MASONRY DRILL-POINTS

How to get

TROUBLE-FREE MOTOR CONTROLS

Specify

these 5 features!



DOUBLE BREAK, SILVER ALLOY CONTACTS

No filing . . no cleaning . . no dressing of these A-B silver alloy contacts. You waste no time on contact maintenance.

ONLY ONE MOVING PART

Simple solenoid construction . . no pivots, pins, hinges, or flexible jumpers. Nothing to wear, stick, or get out of order.

STANDARD RATINGS

In five sizes, up to 50 hp 220 v and 100 hp 440-550-600 v.

EASILY ACCESSIBLE TERMINALS

All connections out in front . . lots of wiring space. White interiors of cabinets make wiring easy in dark places.

HIGH INTERRUPTING CAPACITY

Silver cadmium alloy contacts operate in arc-suppression chambers. Easily interrupts at least ten times full load current.

DEPENDABLE OVERLOAD PROTECTION

Accurate soldered ratchet relays with silver contacts give dependable overload protection. Disuse does not affect their accuracy.

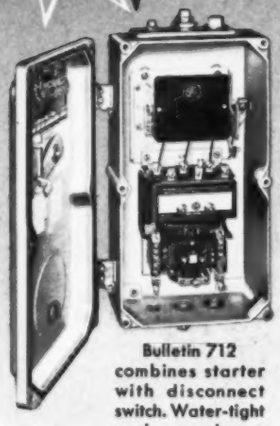
ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

For Continuous Defense Production

use the correct enclosures for all motor starters



Bulletin 712 combines starter with disconnect switch. Water-tight enclosure shown.

How about your starter cabinets? Are you just "getting by" in dusty, wet, or other hazardous locations with ordinary enclosures? If so, look out for starter failures . . . plant shutdowns . . . maybe loss of life.

Why run these risks? It is so easy to pick the right Allen-Bradley enclosure for complete protection against "industrial enemies."

Allen-Bradley solenoid starters have double break, silver alloy contacts. There is no contact maintenance. Just bolt 'em up and forget 'em. Specify A-B starters . . . in the correct enclosures . . . and be safe.

Allen-Bradley Company, 1307 S. First St., Milwaukee, Wis.

STANDARD ALLEN-BRADLEY ENCLOSURES FOR EVERY SERVICE

Nema Type 1 Pressed steel—for general applications

Nema Type 3 Cast iron—for corrosion-proof service

Nema Type 4 Cast iron—for water-proof installations

Nema Type 5 Pressed steel—for non-hazardous dust

Nema Type 7 Cast iron cabinet—for hazardous gases

Nema Type 8 Cast iron cabinet—for corrosive gases

Nema Type 9 Cast iron cabinet—for hazardous dusts

ALLEN-BRADLEY

MOTOR CONTROLS FOR ALL INDUSTRIES

QUALITY

Cleared For Action

[FROM PAGE 21]

line side of the meter, the Emergency Organization forces will handle the work from there on. All questions of official orders, prices, payrolls and the other customary preliminaries to electrical construction work will be negotiated after the work is under way.

The clearing house for all activity is the Electrical Association of Rochester, Inc., whose directors have placed the entire facilities at the disposal of the electrical industry for the emergency project. The actual work of planning and coordinating the several electrical organizations and industry groups is in the hands of a Coordinating Committee consisting of Ed Vanderlinde, Vanderlinde Electric Corp.; T. T. Benz, Industrial Electric Co. and Ray Hornbeck, T. H. Green Electric Co. for the contractors and motor repair shops; C. H. Maier, General Electric Supply Corp. and R. A. Whitford, Requa Electric Supply Co. for the wholesalers; Ivar Lundgaard and Sid Alling, Rochester Gas & Electric Corp. and E. J. Kramer for the Electrical Association.

Records of every journeyman mechanic available are tabulated according to the special qualifications of each man. Experts at cable splicing, switchboard work, heavy conduit work, telephone line repairs, etc., are catalogued for quick reference. Thus, if and when needed, the men dispatched to the job will be not only capable mechanics but exceptionally skilled in the particular type of electrical work that must be done.

For sources of supply for emergency materials, man power and construction equipment, the committee maintains a special file at the Electrical Association offices. At the present time, ordinary materials readily available in jobbers stocks are not listed, however, all special items for emergency service are carefully registered. Large conductors, circuit breakers, transformers, motors, etc., are identified as to source and location for quick pick-up.

Tools and other equipment of wholesalers and contractors, trucks, ladders, drills, compressors, welders, pipe dies, etc., are also registered so that they can be collected and quickly dispatched to the job when needed.

While each executive and worker cooperating grimly hopes that the plan will never be needed they are determined that when and if the bombs come, service and power will be restored as quickly as coordinated human skill and pooled facilities will allow.

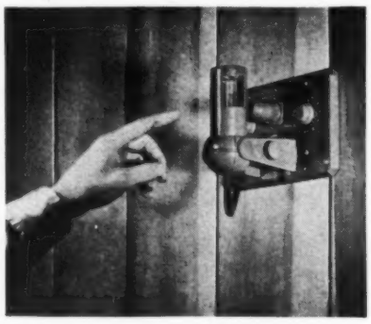
Twist-type Lamp Holder
Blk. Cat. 353 Wht. Cat. 353-W
Combined with Starter Socket Cat. 252. Pats. Pend.
Push-Type Lamp Holder
Blk. Cat. 253
Wht. Cat. 253-W
Combined with Starter Socket Cat. 252
Pats. Pend.
Lloyd Precision Products
Starter Socket Cat. 252
with "Lobster Claw" Dual Lock, used with No. 251 or No. 351 to make combination socket and lampholder No. 253 or No. 353. (Reg. U. S. Pat. Off.) Pat. Pend.
Remote Starter Socket Cat. 352
with "Lobster Claw" Dual Lock. Used separately for remote mounting. (Reg. U. S. Pat. Off.) Pat. Pend.
Lloyd
CERTIFIED
SPEC.
Lloyd
"NO BLINK"
FS-4 NA
Lloyd Starter (Certified by Electrical Testing Lab. Spec. 6)
FS-2 for 15 and 20-watt Lamps
FS-4 for 30 and 40-watt Lamps
Lloyd "No-Blink" Starter FS-4 NA
for 40-watt Lamps
(Listed and Approved by Underwriters' Laboratories Inc.)
Lloyd Precision Products are designed and engineered for perfect performance and the entire Lloyd line leads in streamlined efficiency. All are listed and approved by Underwriters' Laboratories Inc.
Lloyd Policy Insures Quality
LLOYD PRODUCTS CO.
Box C, Edgewood Sta., Providence, R. I.
Representatives in 22 Leading Cities
Export Office 100 Varick St., New York City

Modern Lighting

END ON END fluorescent units provide continuous rows of light in this airplane plant.

ELECTRIC EYE CONTROLS CORNER LIGHTING

When light in the corners of the new Crow Island School in Winnetka, Ill., drops below a predetermined level, a photoelectric relay turns on a row of



DARK CORNERS in this Winnetka school are eliminated by "electric eye" illumination control.

100-watt lamps overhead. Conversely, when the natural light returns to a value above this level the lights are automatically turned off.

This is one of several ultra-modern features of the North Shore suburban school which is attracting national attention because it represents a new concept of educational architecture worked out by Perkins, Wheeler, and Will of Chicago in collaboration with the Finnish designers, Eliel and Eero Saarinen.

CONTINUOUS ROW LIGHTING

Continuous row is a new method of general lighting which has been introduced during the past months and which is rapidly becoming a new standard, especially in the defense industries.

This method of lighting consists essentially of RLM fluorescent units mounted end to end. This unit is employed because of the closed end. When the units are placed end to end the closed ends serve as louvers in that they break up the brightness effect of the long run of lamps when viewed along the row.

An important feature is the continuous channel which runs along above the reflectors. This really serves as a closed wiring trough to which power need only be brought at one convenient point along the row. It supports the reflectors, and carries the auxiliaries, starters and sockets.

This method of lighting possesses several advantages over the conventional individual unit system. Among them are:

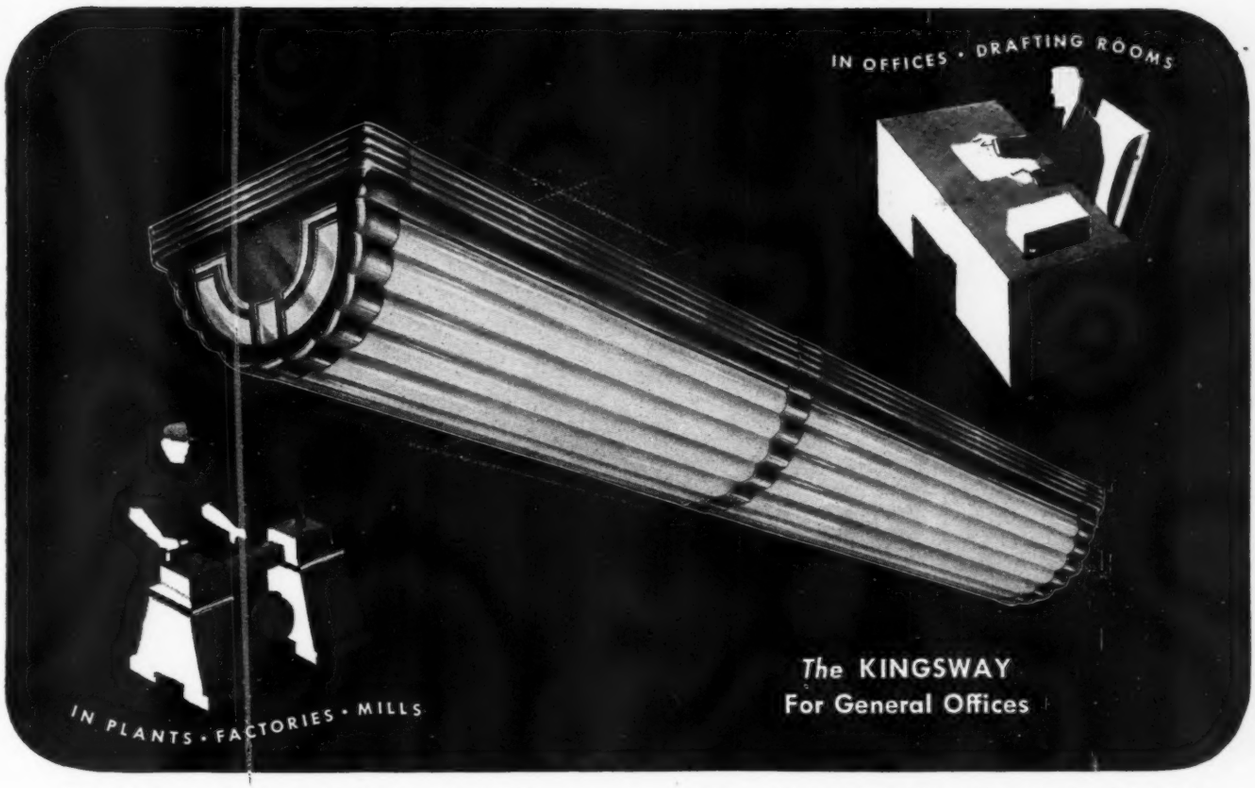
1. Ease of installation.
2. Simplicity of maintenance with quickly detachable reflectors.
3. Higher quality of lighting. For tasks involving work on curved specular surfaces visibility is better than with conventional method of individual units on so-many-foot-centers.
4. Greater flexibility. For example, if the full row is not immediately required every third reflector can be omitted, since the channel is closed with a plate. Further flexibility is provided by using reflectors that are punched for a third lamp. Then, when desired, the third lamp and its accessories can be installed, with a resultant increase in illumination of 50 per cent.

This installation of continuous-row lighting provides approximately 30 foot-candles in service. The units are spaced 13½ feet apart and mounted 22 feet above the floor.

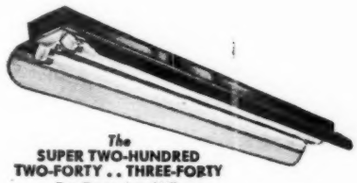
THE PRATT AND WHITNEY INSTALLATION

Pratt and Whitney's new 12 acre plant in Connecticut has engineered lighting for maximum efficiency. The

HIGH BAY lighting with mercury vapor lamps provides 30 foot-candles of general lighting in this airplane plant.



THERE CAN BE NO NIGHT ON THE HIGHWAY TO VICTORY!



The
SUPER TWO-HUNDRED
TWO-FORTY . . THREE-FORTY
For Factories, Mills

The LITEWAY
For Engineering Depts.,
Offices, Drafting Rooms

MULTIPLY MAN HOURS by ADDING LIGHT HOURS

The extra man hours now so urgently needed—in offices, plants, factories, mills—can often be immediately provided by adding effective light hours with Day-Brite Fluorescent Fixtures.

Designed and engineered to utilize the best in fluorescent lighting, Day-Brite fixtures assure improved morale, higher visibility and less fatigue—make it easier to do more work more accurately, faster, with less spoilage, fewer rejects.

DAY-BRITE LIGHTING, INC., 5435 Bulwer Ave., St. Louis, Mo.

Widen all production bottlenecks with light . . . Speed the job with Day-Brite Fluorescent Fixtures —they add light hours that multiply man hours! Consult your local Day-Brite Representative.

DayBrite Rivals Daylight

Adds Defense Hours!

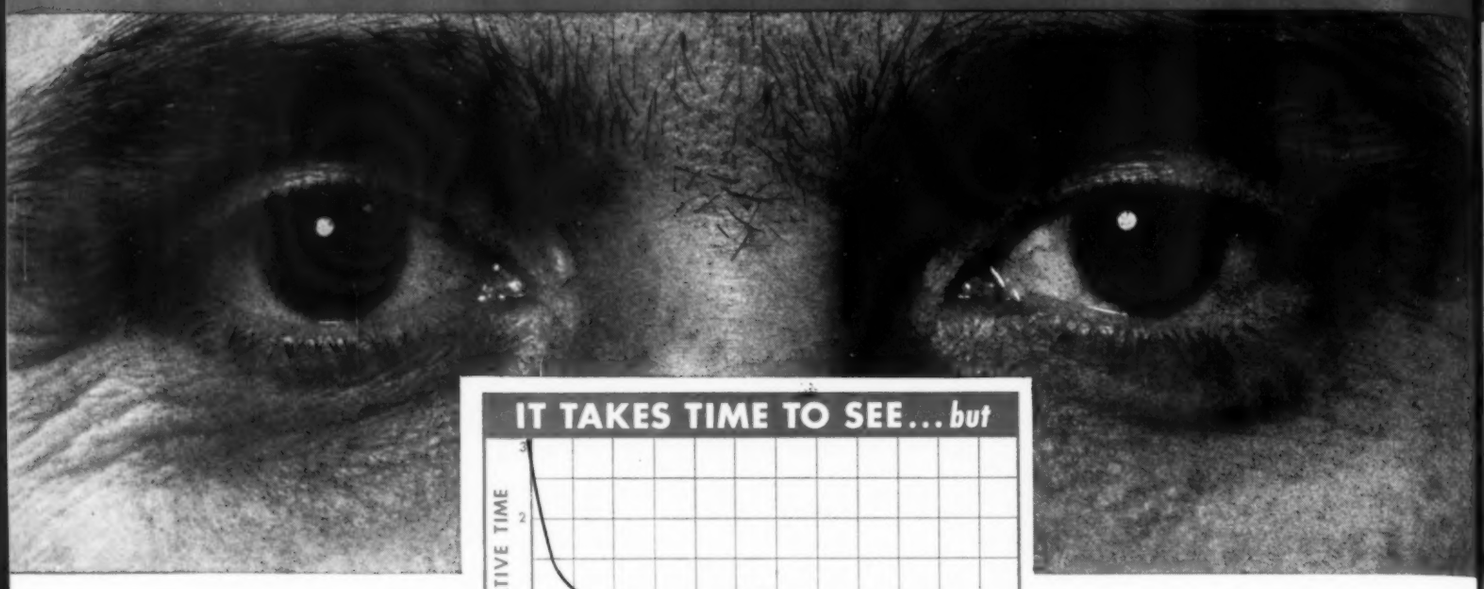
The COMPLETE LINE OF
FLUORESCENT LIGHTING FIXTURES

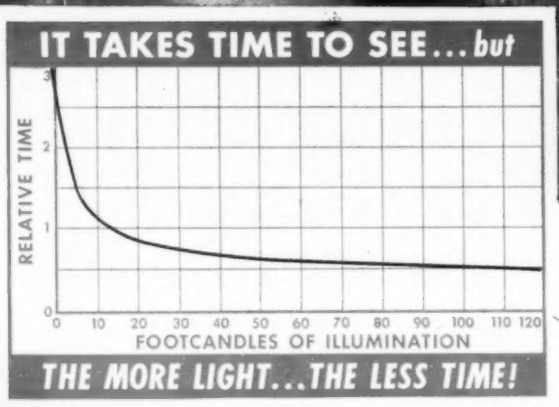
Nationally distributed through all leading electrical supply houses.

Day Brite
FLUORESCENT
FIXTURES

44

How *KEENER EYES* Will





Light Increases Seeing Speed by as much as four times. Scientific studies and experiments have proven the definite relationship between seeing speed and the amount of light. In this graph is recorded the result of a study made of the Time and Light required for perception of a black dot on a white background, the simplest act of seeing.

Now More Than Ever Before Production Is Dependent Upon Older Men Whose Eyesight Is Below Average. More light compensates for visual deficiencies . . . is vitally important in keeping those older men on the "top of their job." It increases ability to see quickly and easily of older men whose eyes, through age, have lost their visual acuity and become deficient. It is important that lighting levels be provided which are sufficiently high to provide adequate lighting for the visually handicapped. For, of employees above 30 years, thirty-nine per cent have deficient vision; require additional light for seeing efficiency that approaches the norm.

THE HUMAN EYE IS LIKE A CAMERA . . . IT REQUIRES TIME AND LIGHT

In the human eye, you'll find the answer to why Better Lighting is so important, why it speeds seeing, conserves eyesight and helps workers sustain production speed and product quality with a minimum of fatigue.

It Takes Time To See. The Science of Seeing has proven that it takes time to see. That while the act of seeing appears to be an instantaneous action, it actually takes time for the eye to fixate and recognize details.*

Better Lighting Increases Seeing Speed. The time required for seeing becomes less as the amount of light is increased. An increase in illumination from one footcandle to twenty results in an increase in seeing speed of approximately three times for normal eyes* . . . even greater increase for older or deficient eyes. For light, according to scientific tests, acts as a magnifier which makes objects easier to see. It is for this reason that objects and defects invisible under poor light become easily visible when higher levels of properly diffused lighting are made available.*

It Takes Energy To See. The act of seeing involves thousands of tiny eye muscles, nervous and physical energy. Time spent in trying to see, therefore, involves physical fatigue. The greater the effort of the eye to see, the greater the drain on the body's physical energy. Physical fatigue in turn slows down production, dulls alertness against accidents, lowers efficiency with its consequent rise in reject rates, wasted materials and sub-standard quality.

Better Lighting Conserves Energy. An improvement in the quantity and quality of the lighting increases the ease of seeing, conserving energy otherwise wasted in trying to see. Thus, good lighting aids in maintaining physical fitness, health and ability of the worker to sustain efficiency over longer periods without detriment to his well being.*

HELP WIN THE WAR!

Lighting to Assure Maximum Employee Efficiency Must be Provided to Win Battle of Production

WHY LIGHTING IS VITAL TO SEEING SPEED AND SEEING SPEED IS VITAL TO FASTER PRODUCTION AND PRECISION

BASIC to all production is the worker's ability to see. The better the worker can see . . . the faster he can work . . . the greater his capacity for sustained production . . . the less fatigue . . . the greater his alertness . . . the fewer the accidents . . . the higher his morale.*

Lighting Can Save a Million Days a Year!

Eyes are blind without light. The better the lighting, the better the eye can see* . . . the faster it can see* . . . the easier it can see.* Millions of minutes per day now being wasted in trying to see can be translated into useful production. In Victory production plants alone, just one minute a day saved by each worker in seeing means over one million days saved per year! Improve the lighting, and time now wasted by the eyes in trying to see under inadequate lighting levels can be used to increase the quantity and quality of production.*

Save Energy . . . Increase Health and Efficiency of *all* Employees

Improve the lighting and the extra energy required in trying to see can be converted into useful production energy, increasing the ability of the worker to stay on the job for longer periods with lower efficiency loss. Raise the lighting levels and older eyes are raised to the efficiency of young eyes . . . sub-normal eyes are given the efficiency of normal eyes at lower lighting levels.

Two Factors of Better Lighting

Better Lighting, therefore will help us to Win this War. Better Lighting involves two factors . . . quantity and quality. It is important that workers throughout the plant be given an equal opportunity to see efficiently by being provided with plenty of light . . . all the light needed as established by the Science of Illumination for the specific seeing task. In general, for Victory production plants, from 35 to 75 footcandles of illumination are required instead of the present estimated average of America's industrial plants of seven and one half footcandles!

It is equally important that the quality of the light be suitable in regard to direction, diffusion, glare and shadow.* More light alone is not the answer.

The Function of Lighting Equipment

It is the function of lighting equipment to provide lighting of both proper quantity and quality.* Available for this purpose are Benjamin lighting units of many types utilizing either Fluorescent, Incandescent or Mercury Lamps as a light source. With these units, most specific lighting problems encountered in industrial lighting production are susceptible to one or more solutions.

Durability and Maintenance Essential Factors in Victory Plant Lighting

Lighting equipment for Victory production plants must not only be properly specified and installed but it must have the stamina to stand up under the severe service requirements of industrial operation, day and night, year in and year out. It is for this reason that Benjamin Units are built with that extra safety factor of strength and durability which Benjamin, through 40 years experience, has found essential for equipment that will stand up under the stress, strain and service requirements found in industrial operations.

Benjamin Engineering Help is at your Service

Plants engaged in War production and essential civilian production are invited to utilize the services of the Benjamin Engineering Department. This department will prepare specifications, recommendations, and lighting layout plans, without cost or obligation, for any project be it the lighting of a single operation, a department or an entire plant. The department will also furnish printed data and engineering counsel which will assist executives, architects and engineers in analyzing and solving their lighting problems.

Address the Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois.

* Authority for statements contained in this advertisement. Statements indicated by an asterisk are taken from the proposed "American Recommended Practice of Industrial Lighting" prepared by the Committee on Lighting Practice of the Illuminating Engineering Society and accepted by an A.S.A. Sectional Committee on Industrial Lighting.

Write now to reserve your copy of this new "American Recommended Practice of Industrial Lighting."

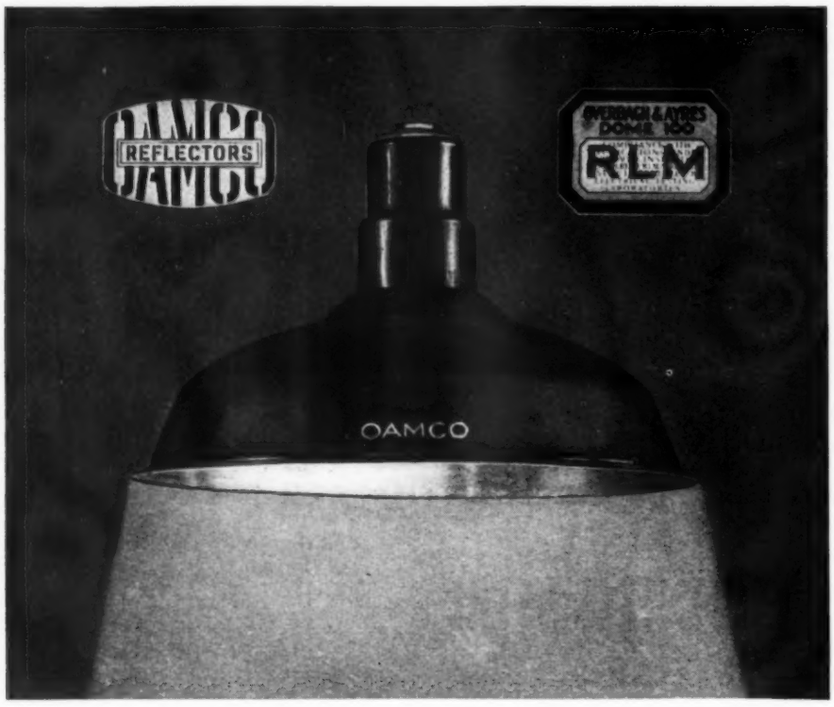
This guide to good up-to-date lighting practice in conformance with the rules of procedure of the American Standards Association is now in the process of being formally approved. As soon as released for publication a complimentary copy will be gladly sent you upon request. Address Benjamin Electric Mfg. Company, Dept. H, Des Plaines, Illinois.

BENJAMIN

World Leader in Industrial

LIGHTING EQUIPMENT

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS



APPROVED
INCANDESCENT LIGHTING

The OAMCO line includes every size, style and type of reflector for industrial and commercial use. Whatever your requirements are, you will find OAMCO reflectors engineered to do the job perfectly—designed for maximum lighting efficiency—manufactured for long years of service. OAMCO reflectors are approved by the Electrical Testing Laboratories and are in accordance with the RLM Standards Institute's specifications. Send today for our catalog showing the complete OAMCO line.

STANDARD REFLECTOR TYPES

TYPE "A"
TYPE "G"
TYPE "C"

DIAM.	WATTS
10"	40 or less
12"	100
14"	150
16"	200

TYPE "F" EXTENDED BRACKET COMPLETE UNIT

TYPE "M" COMPLETE UNIT

	DIAM.	WATTS
M-1	18" Min.	150-200
M-2	20" Do.	300-500

TYPE "I"

	DIAM.	WATTS
I-1	12"	60-75
I-2	12"	100
I-3	14"	150
I-4	16"	200
I-5	16"	300-500
I-6	20"	750-1500

RIGHT LIGHT SINCE 1902

OVERBAGH & AYRES MFG. CO.

MEMBER OF THE R L M STANDARDS INSTITUTE

411 SOUTH CLINTON STREET • CHICAGO

Modern Lighting

[FROM PAGE 78]

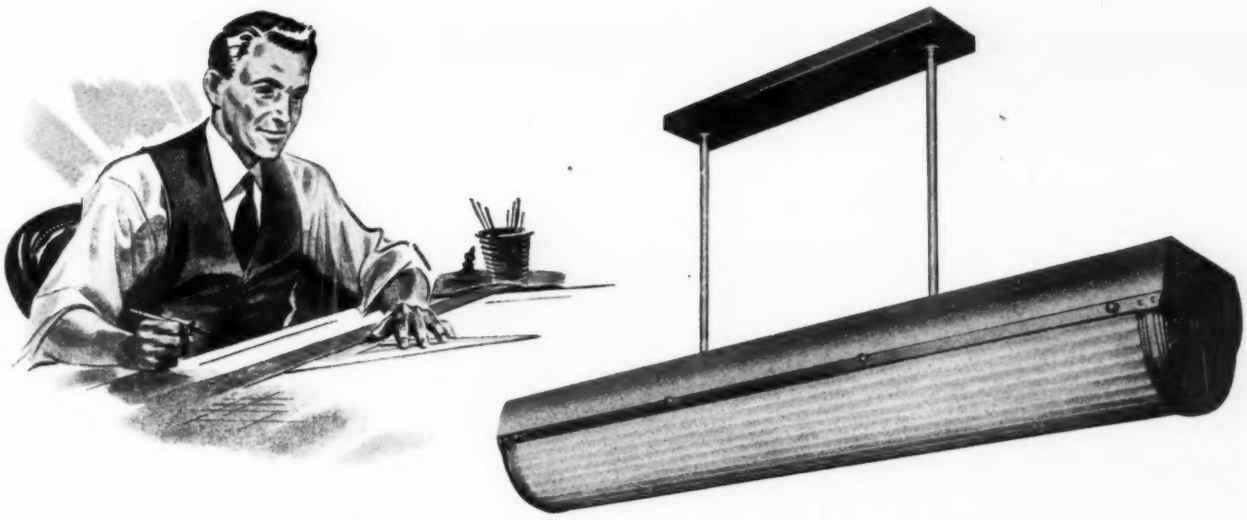
maximum working efficiency. The super-fine tolerances and inspections required by machine tool manufacture are maintained in this high-bay area with the aid of 30 foot-candles of general illumination. Over 2000 400-watt Mazda Type H mercury lamps are employed in Alzak aluminum high-bay reflectors mounted 35 feet high on 16 by 20 foot centers above the craneways.

LIGHT DESK TOPS HELP

The end result of any lighting job is to make the seeing task easier. Consequently everyone who makes lighting recommendations strives to provide the quantity of light and the quality of lighting which will do this. Even after a carefully planned installation, however, the ease of seeing may not be all that it should be and the reason is most likely due to excessive brightness con-

***DARK DESK TOPS** cause excessive brightness contrast between paper and desk. This reduces ease of seeing and eye comfort.*

***LIGHT TOPS** on all desks should be an integral part of office lighting plans. Reflection factors of at least 15 percent create good seeing environments.*



HERE'S ONE FLUORESCENT UNIT FOR EVERY OFFICE LIGHTING NEED

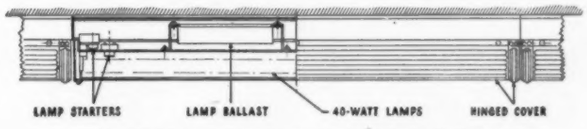
The Westinghouse CL-110 fluorescent luminaire may be suspended from or mounted flush on the ceiling, as an individual unit or end-to-end in continuous strips.

When the luminaire is suspended from the ceiling, both direct and indirect lighting is provided. Light from one 30-watt lamp is directed upward and two or three 40-watt lamps, depending on the unit selected, are arranged to direct their light downward. When the luminaire is mounted directly on the ceiling, the 30-watt lamp is not used.

Regardless of mounting or number of lamps, high power factor and minimized flicker are assured. Maintenance is simplified on glass enclosed units by a hinged door assembly that facilitates cleaning and relamping. Units are also available without the diffusing glass.

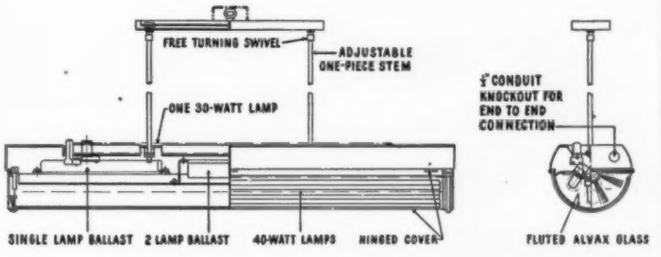
Effective lighting is obtained today with CL-110 fixtures in industrial offices, drafting rooms, factory engineering and purchasing departments. This is Westinghouse *engineered seeing*—a lighting technique that may help you with your own illumination problems. Ask your nearest Westinghouse Lighting Distributor today for Folder 8655. Or, write Westinghouse Electric & Mfg. Co., Edgewater Park, Cleveland, Ohio.

For Continuous Strip or Individual Mounting



Knockouts for end-to-end mounting and straight-through wiring permit continuous lines of light.

CL-110 units utilize either two or three 40-watt lamps when mounted flush on the ceiling.



Both direct and indirect lighting is provided when CL-110 units are suspended from the ceiling.

Light from one 30-watt Mazda F lamp is directed to the ceiling, and two or three 40-watt lamps are arranged to direct their light downward.

Engineered seeing is available through 117 Westinghouse Electric Supply Company offices and Independent Lighting Distributors.

Westinghouse LIGHTING EQUIPMENT

When you sell
QUAD
LIGHTING UNITS
BEARING THE
RLM LABEL
YOU SELL CUSTOMER
Satisfaction
QUAD

RLM

★ When you sell QUAD Lighting Units you sell products scientifically designed to give your customers the highest lighting efficiency. Full line of industrial and floodlighting equipment — incandescent — fluorescent — mercury vapor. It's the line that stays popular.

NO. 1184-M
RLM THREADED
DOME REFLECTOR

QUADRANGLE MFG. COMPANY
Mfgrs. of Incandescent and Fluorescent Lighting Equipment
32 SO. PEORIA ST. CHICAGO, ILL.

[FROM PAGE 82]

trasts between the white paper and the immediately adjacent desk tops. In many cases this may be in the ratio of 10 to 1 assuming a reflection factor of 80 per cent for the paper and eight per cent for the desk top.

Studies made by the Lighting Research Laboratory at Nela Park seem to point to reflection factors of 25 to 30 per cent as desirable for desk tops. This would keep the brightness ratio at about 3 to 1.

While these values are the optimum, it is suggested that all desk tops have a reflection factor of at least 15 per cent. Suitable coverings are available today as attested by the before and after illustrations. Among the materials available are linoleum coverings such as manufactured by Armstrong Cork Co., synthetic photographic finishes such as manufactured by Di-Noc Mfg. Co. of Cleveland and the Parkwood Textolite made by General Electric Co.

Lighter desk tops are a comparatively new idea. They contribute much, however, to the creation of a good seeing environment and consequently should form a part of any office lighting discussion.

OPEN TROUGH OFFICE LIGHTING

An open trough fluorescent lighting system was recently installed by Buhl and Caffrey, electrical contractors of Newark, N. J., in the new district office of the Elizabeth Distribution Headquarters of the Public Service Electric and Gas Company, Elizabeth, N. J.

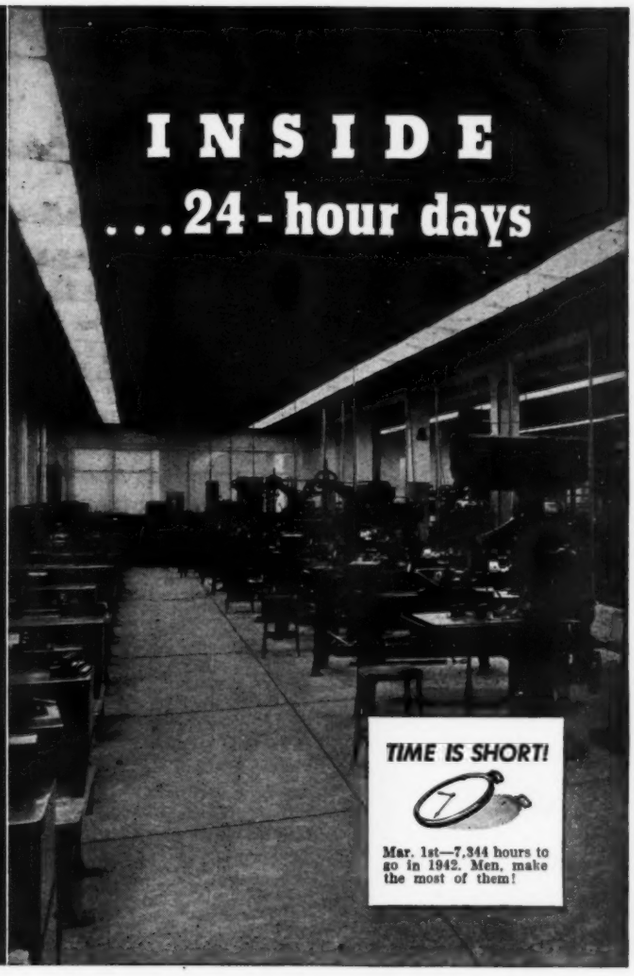
The installation, after several months use, provides 50 foot-candles of glare free illumination at desk level. Fixtures are of the eight-foot and four-foot types,

***ENGINEERED LIGHTING** with continuous fluorescent open trough units, provides 50 foot-candles of sight saving illumination in this office.*

OUTSIDE
...24-hour nights

Help industrial plants prepare for the blackout. Let the MILLER Continuous Wireway Fluorescent Lighting System help you help them...with 50 foot candles or better of 24-hour working daylight.

INSIDE
...24-hour days



THE industrial West Coast is blacking-out. Strategic plants in the East are reported ready to follow suit. How far will the blackout go?

Plants that were perfectly geared to natural daylight must now operate on 24-hour nights. What about *precision* work? What about *inspection?* What about *preferred* "window-side" locations? The brush is blacking-out all natural daylight.

Regardless of where the blackout hits or doesn't hit—don't let industry work its men by moonlight. Recommend and urge MILLER 50 FOOT CANDLER or 100 FOOT CANDLER for all factory areas — MILLER TROFFERS for offices, drafting rooms and similar locations. Sell industry the insurance of 50 foot candles or better of man-made working daylight, 24 hours a day. *Wire for details.* (Representatives in principal cities.)

Get these 5 MILLER Fluorescent Lighting Benefits

HIGHER ILLUMINATION . . . 50 to 100 foot candles—with uniform light distribution.

30 TO 50% LOWER INSTALLATION COSTS . . . Make war production dollars go further.

FASTER INSTALLATION... Steps up building schedules—plants get into production quicker.

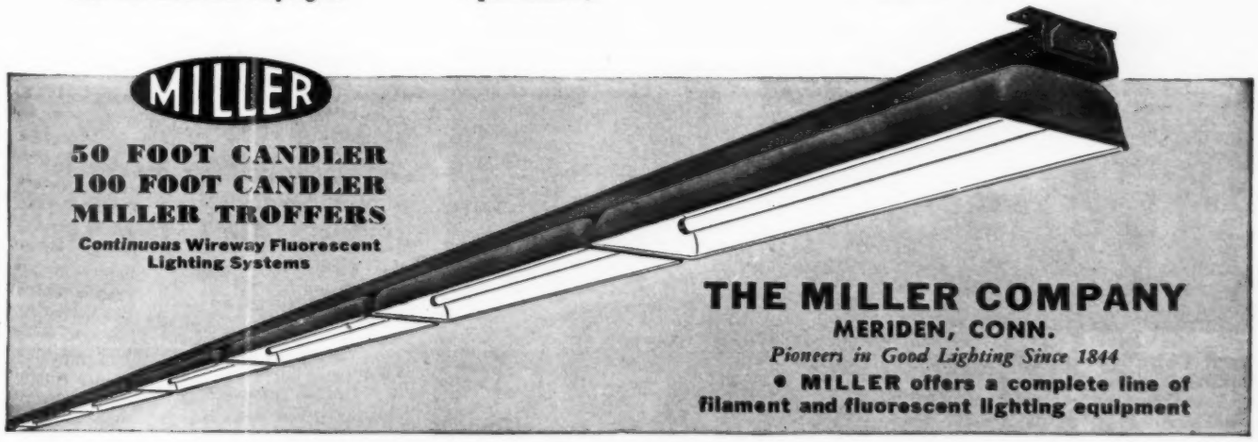
SIMPLIFIED MAINTENANCE... Easy-to-clean, removable porcelain-enamel reflectors — save man-hours for production.

ALLOWANCE FOR FUTURE LIGHTING NEEDS . . . illumination can be increased 45% without new fixtures—lower obsolescence.

MILLER

50 FOOT CANDLER
100 FOOT CANDLER
MILLER TROFFERS

Continuous Wireway Fluorescent Lighting Systems



THE MILLER COMPANY
MERIDEN, CONN.
Pioneers in Good Lighting Since 1844

• MILLER offers a complete line of filament and fluorescent lighting equipment

HERE'S LIGHT FOR INDUSTRY'S FIGHT!

SEE HOW *Mitchell* FLUORESCENT FIXTURES HELP BOOST INDUSTRY'S OUTPUT

The man at the lathe backs up the boy in uniform. Our job is to keep him "seeing" better—working better!

Proper Light is one vital production tool all workers need in industry today. *Seeing better means doing better—and faster.* Today, all over the country, in arsenals, tank and airplane plants, ordnance plants, and general defense plants, batteries of MITCHELL Fluorescent Fixtures pour out a flood of cool, controlled daylight twenty-four hours a day. There's faster "seeing," greater accuracy, better morale, greater safety, uniform quality, less eye fatigue, less wasted energy, fewer mistakes and rejects, better inspection, greater use of floor space, and full daytime efficiency on night shifts.

The lighting needs of America's war industries come *first* at MITCHELL. MITCHELL Fixtures, designed to help win industry's fight, are the result of ingenuity and good, sound engineering. They are easier and less expensive to install, easier to maintain, tougher, sturdier in construction—*built not only for today's tremendous task but for tomorrow's service as well.* There's triple assurance of quality, too, because each unit carries Fleur-o-lier Certification, Underwriters' Approval, and MITCHELL's own Shield of Assurance. MITCHELL Fluorescent is boosting the output of American industry. *See the proof on these pages!*

Pictures like these illustrate the kind of adequate lighting it takes to turn out precision-built Rolls-Royce engines at the Packard plant at Detroit, Michigan. Like many another airplane plant, it's lighted by MITCHELL Fluorescent units for high-speed production.

MITCHELL MODEL NO. 2026. Mitchell's finest—industry's best! For use where high intensity daylight effect is essential twenty-four hours a day! Uses 2 100-watt, 60-inch lamps. Approved high-power ballasts and starters. Power factor corrected. Heavy gauge vitreous steel with triple-coated porcelain enamel reflectors. For chain suspension.

MODEL NO. 2025 P.—As above, but with open ends.

★ ROLL-CALL ★

MITCHELL industrial installations read like a "Blue-Book" of American industry. Here is a partial listing of MITCHELL Fluorescent users:

U. S. Army
U. S. Navy
U. S. Marine Corps
U. S. Air Corps
Bellanca Aircraft
Bendix Products
Boeing Aircraft
British Purchasing
Chrysler Corp.
Consolidated Aircraft
Delco Products
Empire Ordnance
Firestone Tire
Ford Motor Co.
General Motors
General Tire
Hudson Motors
Kelsey-Hayes
Marlin Arms
Packard Motors
Pontiac Motors
Pratt & Whitney
Remington Arms
Sherwin-Williams
U. S. Machine Corp.
Vultee Aircraft
Waco Aircraft
Willys-Overland

★ ★ ★

They're dealing in accuracies of one ten-thousandth of an inch at the Kelsey-Hayes Wheel Company of Plymouth, Michigan. You can't afford to make mistakes on a machine-gun mechanism. That's why management insists on lighting for accurate high-speed production—light provided by MITCHELL No. 2026 Fluorescent units.

MITCHELL MODEL NO. 2010. Mitchell's answer to the demands for general and localized high-intensity lighting at low cost. Uses 2 40-watt, 48-inch lamps. Heavy-gauge steel throughout; triple-coated porcelain enamel reflector. For suspension mounting. Approved ballasts and starters. P.F. corrected.

MITCHELL MODEL NO. 2034—THE "VICTORY." Mitchell's *newest* fixture features triple-coated vitreous porcelain enamel reflector of 1-piece, non-welded construction. Uses 2 40-watt, 48-inch lamps. Constructed of heavy-gauge vitreous steel. For chain or rigid suspension. P. F. corrected. Approved ballasts and starters. Easy to install; easy to service and maintain.

NO. 2035—3 LAMP—150 WATTS

MITCHELL URC RESEARCH LUMINAIRE. Here's the fixture for the man *behind* the man in production—the unit that's giving war production planners and office workers higher levels of comfortable, glareless light! Ideal for these times, The U.R.C. is the result of over two years of intensive research. Uses 4 40-watt, 48-inch lamps. Prismatic ribbed bottom glass panel and ceramic-coated glass side panels screen out glare. Satin aluminum trim. Can be hung in any one of three ways. P. F. corrected. Approved ballast and starters. Unbelievably low priced!

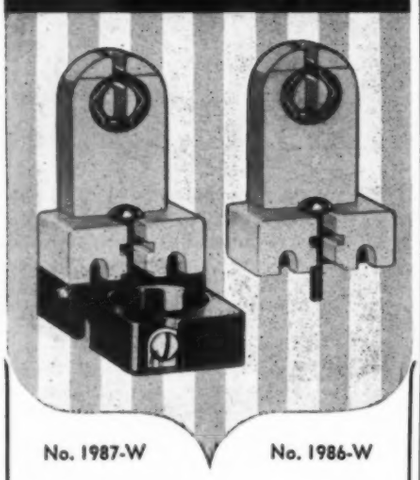
MITCHELL MANUFACTURING CO.
2525 Clybourn Ave., CHICAGO

MITCHELL
FLUORESCENT

Eyes count in the drafting rooms and offices that are the "brains" of the war effort. Here's a high-level glareless U. R. C. installation in the drafting rooms of the Gisholt Machine Corp. of Madison, Wis.

P&S
WIRING DEVICES

For The
"ALL-OUT"
WAR EFFORT



No. 1987-W No. 1986-W

Economical Fluorescent Lighting for 24-hour top-speed efficiency with

P&S SOCKETS

The popular Twist-Turn Type—Precision-made to the same high standards identifying P&S products for over 50 years.

STOCKS AVAILABLE NOW

Send for your copy of the P&S Catalog.

Sold Through
Electrical Wholesalers

Pass & Seymour, Inc.
SYRACUSE, N. Y.

Modern Lighting

[FROM PAGE 84]

the large ones having two 40-watt lamps mounted in tandem fashion. The shorter units are used in the corridors and between offices. The units are mounted flush in an 11-ft. suspended acoustical tile ceiling. Spacing is five feet between rows and two feet between the ends of the fixtures. The No. 18 gauge sheet steel fixture troughs are painted inside and out with a flat white paint. Separate steel boxes, concealed between the units in the ceiling, house the lamp auxiliaries. Access to these enclosures is provided by removable sections of the acoustic cork ceiling.

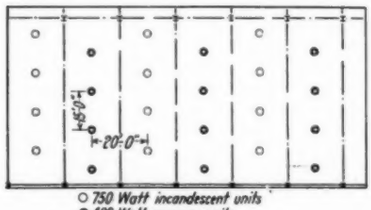
Lighting a HIGH BAY AREA

Mercury and Incandescent

PROBLEM—To provide adequate illumination for the working area under a high bay crane way in a manufacturing plant.

CONSTRUCTION DATA—The building is of brick, glass and steel construction. One side of the area has two levels of glass windows; on the other side the windows are in the high bay monitor. A large traveling crane operates over the entire bay, so lighting units must be high enough to clear the crane.

SOLUTION OF PROBLEM—General illumination is provided by a staggered arrangement of mercury and incandescent concentrating type high bay Alzak aluminum reflectors, mounted 36 feet above the floor on 15-foot by 20-foot centers. The incandescent units use a 750-watt lamp; the other units use a 400-watt mercury lamp. The units mounted near the windows are equipped with visors.



PLAN VIEW *showing the staggered arrangement and spacing of the high bay lighting units.*

RESULTS—After nine months use, the average illumination intensity on the working plane is 20 foot-candles.

HIGH BAY *lighting in this mid-west industrial plant is accomplished with a staggered arrangement of incandescent and mercury units.*

NAME OF MANUFACTURER
COMPLIANCE WITH
SPECIFICATIONS UNDER
APPROVED INSPECTION
PROCEDURE OF RLM STANDARDS
INSTITUTE CERTIFIED BY
ELECTRICAL TESTING
LABORATORIES
RLM
Guarantee
This RLM certified lighting unit, when properly installed and under normal conditions of use, is guaranteed against mechanical and electrical defects for a period of 90 days from date of delivery to the purchaser. Correction of such defects by repair or replacement of material only shall constitute fulfillment of all obligations under this guarantee by the undersigned manufacturer or distributor.

RLM Deep Bowl Reflector

RLM Silvered Bowl Diffuser

RLM 48" Fluorescent Twin Lamp Unit

"All Out" VICTORY Production Demands the Best LIGHTING EQUIPMENT

There can be no compromise on *quantity* or quality of light, if armament output is to reach and maintain a victory-assuring peak! When workpeople can see easily they do more and better work. Adequate light—properly directed—often makes possible 15 to 25 per cent more output in an available plant . . . permitting new plants to be used for other vital war production. Only by providing and maintaining good lighting can sustained effort and peak efficiency be assured every day . . . 24 hours a day.

Assurance that you will secure the maximum in production-accelerating lighting performance . . . economy of operation . . . and economy of maintenance . . . depends to a large degree upon the basic design and construction of your lighting equipment.

When you purchase Lighting Units bearing the RLM LABEL you know that exacting laboratory and engineering tests have proved that they (1) Conserve light and power; (2) Stand up under the vibrations and heavy-duty service of producing machinery; (3) Require a minimum of time and cost to maintain at their original lighting efficiency; (4) Have uniform quality. Only Industrial Lighting Units built to exacting RLM Specifications, and certified by Electrical Testing Laboratories are permitted to carry the RLM LABEL. Write for booklet, "The Meaning of the RLM LABEL."

RLM Dome Reflector

RLM Symmetrical Angle Reflector

RLM 60" Fluorescent Twin Lamp Unit

The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE
INCORPORATED

307 N. MICHIGAN AVE. SUITE 1600 • CHICAGO, ILL.

Estimating

ESTIMATING GUIDES

—Studying Plans and Specs.

This is the first in a series of several items under the heading "Estimating Guides," designed to present a concise review of the important steps necessary to turn out an accurate and complete estimate. A uniform system is needed whether the estimate is to be used primarily for cost-plus jobs, or for competitive bidding.

Such a system is doubly effective today when conservation of material and time are important steps to victory in our war program. Errors made in material and equipment take-off means delays in rushing defense construction to completion. Filling last minute "pick-up" orders for material to complete jobs means additional headaches for manufacturers and suppliers. Over-ordering due to error means diverting unnecessary essential materials from jobs where it might be needed.

The Electrical Contractors Association of Chicago has listed numerous steps which, if followed closely will form the basis of a systematic estimating and take-off procedure. The first steps of this series are listed below.

RECORD PLANS and SPECIFICATIONS—

After receiving a set of plans and specifications, the first step is to make a complete record of them. This means recording:

1. **Set numbers**
2. **Sheet numbers**
3. **Dates of original plans and specifications**
4. **Revisions—dates and nature of same**
5. **Addenda—dates and nature of same**
6. **Scale of plans**
7. **Type of construction**
8. **Number of floors**
9. **Area—each floor and total**
10. **Ceiling heights**

STUDY PLANS—The next logical step is to carefully study the plans. While doing this, check for:

1. **Typical floors**
2. **"Half plans"**
3. **Exterior work**
4. **Duplicate buildings**
5. **Dimensions and scale shown on plans. Check them against each other.**
6. **Important rates — underscore them with colored pencil**
7. **Items might be overlooked—make notes of such items**

STUDY SPECIFICATIONS — Specifications should be carefully studied in conjunction with the plans. When doing so:

1. **Make notes of important items. For example:**
   (6) Wire-type R.P.—page 4
   (7) Furnish thermal switches—page 10
2. **Note items that are specified but not shown on plans. Note plans accordingly**
3. **Carefully check for division of bid, unit price information and alternates**
4. **Check for clauses referring to temporary work.**

Once the above points have been checked, the task of take-off, pricing and listing can follow.

WEIGHT-COST CURVE FOR INSTALLING CONDUIT

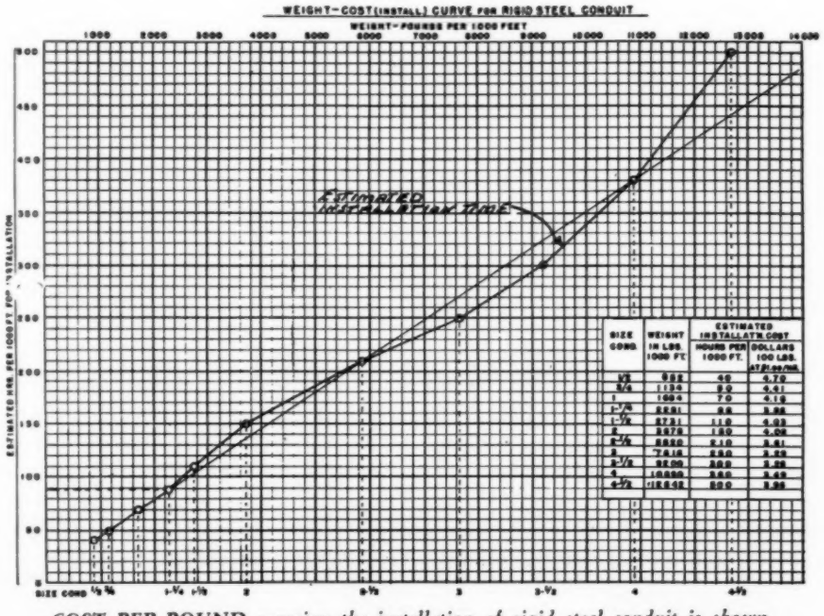
That a definite relationship exists between the weight of rigid steel conduit and its installation cost is graphically illustrated by the accompanying chart compiled by the Electrical Contractor's Association of Chicago.

The plotted points on the irregular curve are based on a round-up of data collected from contractors who made time studies on their jobs. These values are based on a breakdown which includes the following operations:

1. Study time, ordering and checking.
2. Unloading and delivering to storage space.
3. Moving from storage to point of installation.
4. Laying out runs and measuring for nipples.
5. Setting up and handling tools.
6. Cutting conduit—including three cuts per 100 feet.
7. Threading and necessary cleaning for fine thread per 100 feet.
8. Installing conduit—excluding ells and offsets.
9. Installing two ells and couplings per 100 feet.
10. Making and installing offsets.
11. Making two conduit connections per 100 feet at pull boxes or cabinets.

These labor units are based on the conduit being installed exposed on a 12-ft. ceiling. The time for drilling for and fabricating fastenings and hangars is not included.

It is interesting to note that the curve closely follows a straight line relationship as shown on the chart. A slight hump occurs between the 1¼-in. and 2-in. conduit sizes when weight begins to count and a change is made to heavier hand tools. Between sizes 2½-in. to 4-in. a dip occurs indicating that the labor saved by using the power tools necessary on larger sizes is more than enough to offset the added labor necessary because of increased weight. From 4½-in. up, the curve takes a sharp increase due to the exceptional weight and bulkiness of these sizes.


WEIGHT-COST (INSTALL) CURVE FOR RIGID STEEL CONDUIT
WEIGHT-POUNDS PER 1000 FEET
ESTIMATED INSTALLATION TIME
SIZE COND.
WEIGHT IN LBS. 1000 FT.
ESTIMATED INSTALLATN. COST
HOURS PER 1000 FT.
DOLLARS 100 LBS. AT $0.06

COST PER POUND covering the installation of rigid steel conduit is shown in this time-weight curve which approximates a straight line relationship. Humps and dips indicate the effect of using large hand tools, motorized equipment and bulkiness of largest sizes.

WRAP UP THE JOB

Tight . . . Fast . . . and Make It Last!

with PANTHER and DRAGON Tapes

1. First to be Wrapped and Sealed in Cellophane
2. Perfect Adhesiveness and Tensile Strength
3. Strong Distinctive Green Core
4. Colorful Attractive Boxes
5. Made by a Company in the Insulation Business Since 1878

Sold Exclusively Through Distributing Wholesalers

HAZARD INSULATED WIRE WORKS
DIVISION OF THE OKONITE COMPANY
Works: Wilkes-Barre, Pennsylvania
Offices in Principal Cities

PANTHER DRAGON
FRICTION AND RUBBER TAPES

24 HOURS of DAYLIGHT

The YEAR AROUND with

WHEELER
FLUORESCENT
LIGHTING UNITS

Wheeler Fluorescent Lighting Units afford almost every industrial plant in the country the opportunity to operate under Daylight working conditions twenty-four hours a day the year around.

No single factor is more important to efficient, sustained production effort than Good Lighting—Lighting that is designed to meet the specific requirements of each individual task or operation; Lighting that helps eliminate accidents, eye strain, fatigue, rejects, slow-downs in production; Lighting that enables workers to see clearly and easily at all hours—day and night.

You can help workers to make new production records by selecting from the complete Wheeler Fluorescent line types of units that meet every lighting requirement.

If you are planning or considering a Fluorescent installation, we will be glad to be of assistance. A complete engineering service is at your disposal.

* * *

For complete data write for a copy of New Bulletin "Wheeler Fluorescent Lighting Equipment".

Distributed Exclusively Through Electrical Wholesalers. Manufacturers of Lighting Equipment Since 1881.

WHEELER REFLECTOR COMPANY
275 CONGRESS ST., BOSTON, MASS.

NEW YORK · CLEVELAND · REPRESENTATIVES IN PRINCIPAL CITIES

Estimating

[FROM PAGE 90]

ESTIMATING GUIDE POSTS

Continuing an analysis of cost approximations on power jobs, the following tables are intended to be used with those appearing on pages 78, 80 and 82 of February *Electrical Contracting*.

The approximations shown are especially valuable as a quick method for checking more detailed estimates or assembling preliminary cost data. On cost plus fixed fee jobs or other projects where critically accurate estimating is not essential these figures will provide a reasonable close prediction of job costs for budgets or labor schedules.

In previous articles, check figures for lighting branch circuits and feeders were analyzed. This group of tables provides similar check units for motor branch circuits.

The conditions assumed in this analysis include a 65-ft. run from a power panel to an individual motor. A factor at the bottom of each table provides for correcting the average circuit length to special conditions which may appear on the actual layout. The circuit assumed is conventional.

The cost and installation charges for the motors or starters and their supports are not included in the tables. The corrections, however, are included. No allowance has been made for insurance, taxes, overtime or supervision. The material prices are approximate and based upon Middle West delivery as of July 1, 1941. They should be checked with prevailing local quotations and adjusted accordingly.

Labor is shown in man hours. In the previous article on feeders, the data also gives labor in man hours. The instruction in the text to divide by two is an error.

It should again be emphasized that these figures should be carefully qualified by the conditions on the work they are used to check. Their use by a skilled estimator can save time and cut much detailed figuring. They are not, however, intended as a short cut method of estimating or checking where a high degree of accuracy is essential.

Table 1

Branch Load	3 hp.	
Branch Size	3 No. 14-½-in.	
Branch Fuses	30 amp.	
Motor Switch	30 amp.	
	Mat.	Lab.
1 3 Pole Switch	3.50	1.00
4 Anchors	.10	.52
12 Fuses	.40	
1 Connecting Motor	.02	1.85
4 Anchors	.10	.52
65 ft. Galvanized Conduit	3.71	1.17

How R. H. Forbes gets load and voltage facts IN A HURRY!

"WITH our plant operating three shifts a day, seven days a week, we must watch our electric equipment closely to keep it operating at peak efficiency and to prevent breakdowns. That means constant testing.

"The G-E hook-on volt-ammeter is the handiest instrument we have for this work, because it measures volts as well as amps, and enables us to make our tests quickly."

These are the words of R. H. Forbes, chief electrician, United Paperboard Company, Thomson, N. Y.

A 6-in-1 Instrument

The reason why the AK-1 hook-on volt-ammeter is so handy is that it's really six instruments in one. It has six ranges—0–15/60/150/600 amperes and 0–150/600 volts (for a-c circuits only).

To measure amperes, all you do is hook it around a conductor, flick the selector switch to **AMPERES**, and there's your measurement—no cutting of conductors, no interruption of service.

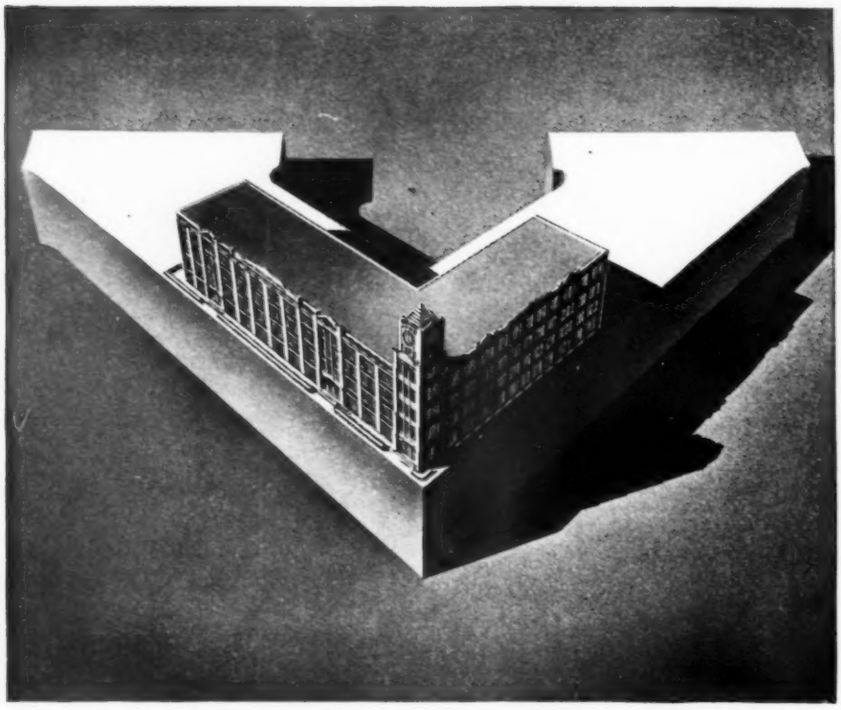
To measure volts, all you do is connect the voltage leads, snap the switch to **VOLTS**, and take the reading. You don't need any extra equipment.

Extension poles, in four- and six-foot lengths, are available for using the AK-1 on high-voltage circuits, and for reaching into inaccessible places. Also, a cowhide leather carrying case can be obtained for protecting the instrument when it is not in use.

For complete details, ask your G-E office for a copy of Bulletin GEA-2950. Or write to General Electric Company, Schenectady, N. Y.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC



WORKING FOR VICTORY

Good lamps and quantities of them are essential to the all-out production effort that will win the war.

Under this roof every worker, every engineer and every inspector guarding the quality and dependability of Champion Lamps, is concentrating on the task of turning out the very best lamps using the least amount of critical war materials.

If *our* efforts succeed in contributing to *your* production efforts we shall consider it a job well done. Get in touch with the nearest Champion distributor. See what he can do to meet your present need for good lamps at low cost. We'll gladly send you his name if you haven't it.

★ Pictured above is the home of Champion Lamps—the headquarters of an organization that has devoted its skill, experience and resources since 1900 to the making of electric lamps of unsurpassed quality — licensed under General Electric Co. incandescent and fluorescent lamp patents. ★

CHAMPION LAMP WORKS
Lynn, Massachusetts
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

Estimating

[FROM PAGE 92]

7	Conduit Supports	.13	.28
7	Anchors	.18	.91
6	Elbows & Couplings	1.20	.96
5	Locknuts & Bushings	.05	.40
1	ft. Flexible Conduit	.04	.05
2	Greenfield Connectors	.05	.10
220	ft. Wire	1.19	.70
	Sundries	.07	
	Total	10.74	8.46
	Each Additional Foot	.08	.05

Table 2

Branch Load		5 hp.	
Branch Size		3 No. 12-½-in.	
Branch Fuses		40 amp.	
Motor Switch		30 amp.	
		Mat.	Lab.
1	3 Pole Switch	3.50	1.00
4	Anchors	.10	.52
12	Fuses	.40	
1	Connecting Motor	.02	1.90
4	Anchors	.10	.52
65	ft. Galvanized Conduit	3.71	1.17
7	Conduit Supports	.13	.28
7	Anchors	.18	.91
6	Elbows & Couplings	1.20	.96
5	Locknuts & Bushings	.05	.40
1	ft. Flexible Conduit	.04	.05
2	Greenfield Connectors	.05	.10
220	ft. Wire	1.74	.79
	Sundries	.08	
	Total	11.30	8.60
	Each Additional Foot	.08	.05

Table 3

Branch Load		10 hp.	
Branch Size		3 No. 8-¾-in.	
Branch Fuses		65 amp.	
Motor Switch		60 amp.	
		Mat.	Lab.
1	3 Pole Switch	5.75	1.60
4	Anchors	.10	.52
12	Fuses	1.80	
1	Connecting Motor	.02	3.00
4	Anchors	.14	.60
65	ft. Galvanized Conduit	4.75	1.43
7	Conduit Supports	.17	.28
7	Anchors	.18	.91
6	Elbows & Couplings	1.62	1.14
5	Locknuts & Bushings	.10	.50
1	ft. Flexible Conduit	.06	.05
2	Greenfield Connectors	.14	.14
220	ft. Wire	3.87	1.40
	Sundries	.10	
	Total	17.80	11.57
	Each Additional Foot	.13	.06

Table 4

Branch Load		15 hp.	
Branch Size		3 No. 6-1¼-in.	
Branch Fuses		80 amp.	
Motor Switch		60 amp.	
		Mat.	Lab.
1	3 Pole Switch	5.75	1.60
4	Anchors	.10	.52
12	Fuses	1.80	
1	Connecting Motor	.02	3.40
4	Anchors	.14	.60
65	ft. Galvanized Conduit	9.10	2.60
7	Conduit Supports	.34	.35
7	Anchors	.25	1.05
6	Elbows & Couplings	3.24	2.46

WHEN two MEN ARE WORKING WHERE one WORKED BEFORE . . .
it's time to install
PLUGMOLD

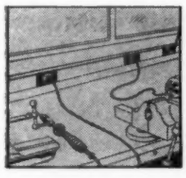
● Here, Mr. Contractor, is an idea that you can sell to almost any industrial plant in your territory that is trying to keep pace with defense production demands.

PLUGMOLD is such a simple, obvious way to provide plenty of handy convenience outlets along assembly or inspection benches . . . in engineering departments . . . around laboratory tables . . . and in offices . . . that plant men who have once seen its advantages wonder why they never thought of it before. Certainly this is a TIME-saver, STEP-saver and WORK-speeder that will pay for itself many times over in busy defense industries.

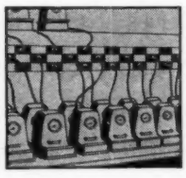
We'll be glad to work with you in planning industrial Plugmold installations. Write us direct.

THE WIREMOLD COMPANY
HARTFORD, CONN.

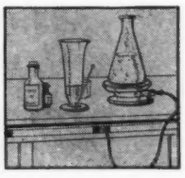
LITTLE THINGS LIKE THESE STEP UP PRODUCTION AT LOW COST



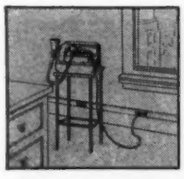
All the outlets needed for light electrical hand tools, soldering irons, work lights, etc.



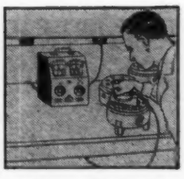
Multiple rows of Plugmold for plugging in electrical apparatus on test.



Under the tables or counters in the laboratory or engineering department



Plenty of outlets in exactly right places for business machines in offices.



For inspection benches where electrical test instruments are in use.

PLUGMOLD

PLUG-IN-ANYWHERE WIRING SYSTEMS

by

WIREMOLD

MORE OUTLETS for MORE OUTPUT

You're selling fixtures built to definite, dependable standards checked by impartial experts

More than 35 different manufacturers build Fleur-O-Lier fixtures. But all FLEUR-O-LIERS meet 50 rigid specifications set up by MAZDA lamp makers to assure you electrical, mechanical and lighting excellence . . . *Certified* by famous, impartial Electrical Testing Laboratories. The FLEUR-O-LIER Certification label on a fixture protects you . . . and your customer's lighting investment!

All the features your customers want are Certified

No matter what make of FLEUR-O-LIER you sell, your customers get features they need and want to give them years of satisfactory service. Such features include: flicker

FLEUR·O·LIERS

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer

Selling Power

FLEUR-O-LIER LABEL?

correction, durability and safety, ease of maintenance, efficient lighting performance.

Certified ballasts and starters

That means balanced operation... and high power factor (over 85%).

Wide variety — every unit guaranteed

FLEUR-O-LIERS are made in over 100 different types, sizes and designs to fit industrial and office needs...and every unit carries the FLEUR-O-LIER Manufacturers' guarantee.

Certified quality for reliable service — low maintenance costs

For wartime production, Fleur-O-Liers supply fluorescent lighting at its best—dependable, satisfactory, long-run service for the big job ahead—whether the job is for factories, drafting rooms, or offices. Maintenance costs are surprisingly low—performance is balanced, economical . . . service worries at a minimum.

Powerful national advertising

Dominating advertisements in SATURDAY EVENING POST, TIME, NEWSWEEK and leading trade and business publications are doing a big pre-selling job for you. Take advantage of them!

Sell fixtures with the FLEUR-O-LIER label. It's a potent selling tool

It's a badge of honor on a fixture...your assurance of 50 safeguards that mean greater selling opportunities!

Be sure to send for your FREE copy of the new booklet—"50 Standards for Satisfaction"—full of important information, together with list of certified manufacturers. Use coupon below.

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

who complies with FLEUR-O-LIER requirements

TEAR OUT AND MAIL

Fleur-O-Lier Manufacturers
2122-3 Keith Building, Cleveland, Ohio

Please send me FREE new booklet "50 Standards for Satisfaction," together with list of Fleur-O-Lier manufacturers.

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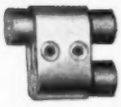
"Picking the correct tap is EASY—

from the MOST COMPLETE lin of Cable Taps

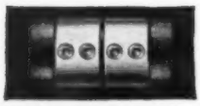
Now you can select from a really *complete* line of standard and special taps. Every one carefully designed and manufactured.

Parallel and 90° taps — and combinations — in the widest variety. For conductor sizes up to 1,000,000 CM.

Gutter Tap with Bakelite Cover. Insulating covers can be furnished for all types of Penn-Union cable taps.



2-way Gutter Tap. Main and branch sizes 8 to 1,000,000.



Two Separate Parallel Taps to a continuous main conductor.

Combination Cable Taps; one branch parallel to main, and one at 90°.

Hinged Clamp of Penn-Union Type HFM makes installation easy. Multi-slit tapered sleeve assures permanent grip on branch.

Positive Equalized Pressure on main and branch, with Penn-Union Type SM. Tightening torque is accurate measure of the clamping force.

Also the *most complete line* of Service Connectors — Terminals — and thousands of other fittings, for all requirements.

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

Estimating

[FROM PAGE 94]

5	Locknuts & Bushings	.25	.95
1	ft. Flexible Conduit	.15	.06
2	Greenfield Connectors	.30	.22
220	ft. Wire	6.07	1.58
	Sundries	.12	
	Total	26.53	15.39
	Each Additional Foot	.22	.08

Table 5

Branch Load	20 hp.	
Branch Size	3 No. 4-1¼-in.	
Branch Fuses	100 amp.	
Motor Switch	100 amp.	
	Mat.	Lab.
1	3 Pole Switch	10.75	2.10
4	Anchors	.14	.60
12	Fuses	3.60	
1	Connecting Motor	.02	4.20
4	Anchors	.24	.76
65	ft. Galvanized Conduit	9.10	2.60
7	Conduit Supports	.34	.35
7	Anchors	.25	1.05
6	Elbows & Couplings	3.24	2.46
5	Locknuts & Bushings	.25	.95
1	ft. Flexible Conduit	.15	.06
2	Greenfield Connectors	.30	.22
220	ft. Wire	8.07	1.94
	Sundries	.15	
	Total	36.00	17.29
	Each Additional Foot	.26	.09

Table 6

Branch Load	25 hp.	
Branch Size	3 No. 3-1¼-in.	
Branch Fuses	125 amp.	
Motor Switch	100 amp.	
	Mat.	Lab.
1	3 Pole Switch	10.75	2.10
4	Anchors	.14	.60
12	Fuses	3.60	
1	Connecting Motor	.02	4.70
4	Anchors	.24	.76
65	ft. Galvanized Conduit	9.10	2.60
7	Conduit Supports	.34	.35
7	Anchors	.25	1.05
6	Elbows & Couplings	3.24	2.46
5	Locknuts & Bushings	.25	.95
1	ft. Flexible Conduit	.15	.06
2	Greenfield Connectors	.30	.22
220	ft. Wire	10.34	2.11
	Sundries	.20	
	Total	38.92	17.96
	Each Additional Foot	.30	.09

Data from A. J. Allyn, Chicago, Illinois.

GLIMPSES OF OURSELVES

NO PLACE TO TAKE A CHANCE .. HE RELIES ON KLEIN

"Since 1857"

Up at the top of a pole is no place to gamble with tools. That's why you will find Klein pliers in the hands of linemen—everywhere! They know the inbuilt quality, the years of experience, the reputation for service that is back of every pair.

Your copy of the Klein Pocket Tool Guide will be sent on request.

ASK YOUR SUPPLIER
Foreign Distributor:
International Standard Electric Corp., New York

Mathias **KLEIN** & Sons
Established 1857 — Chicago, Ill. U.S.A.
3200 Belmont Avenue, Chicago, Illinois

How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

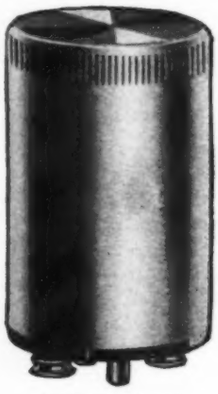
Advertising speeds vital information from those who have it . . . to those who need it.

McGraw-Hill Publishing Company, Inc.
330 West 42nd Street New York

EQUIPMENT News

Starter

This new FS44 starter is of the 4-pin mogul size. It was developed for use especially for low temperature lamp operation such as encountered in refrigerated cases and certain outdoor applications. It is also suitable for use on direct current. It is used with 40-watt lamps. The Bryant Electric Company, Bridgeport, Conn.



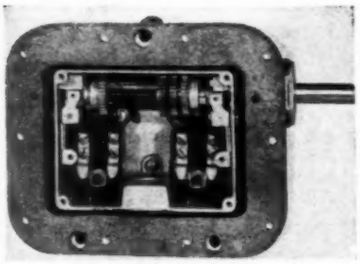
BRYANT STARTER

■

Fluorescent Industrial Unit

This new fluorescent industrial lighting fixture is known as "The Victory." It has a porcelain enamel reflector of one-piece, seamless, non-welded construction. It is available in two models—No. 2034 uses two 40-watt fluorescent bulbs and No. 2035 uses three 40-watt bulbs. A 13½ degree cut-off eliminates glare from all normal viewing angles. Reflector is detachable from housing by removal of two wing nuts. Power factor corrected. It is for use on 110-125 volts, a.c. 60 cycle. Also available for 50 cycle operation or for 220-250 volts. Both units are Fleur-O-Liers. Mitchell Manufacturing Company, 2525 Clybourn Avenue, Chicago, Ill.

MITCHELL INDUSTRIAL UNIT

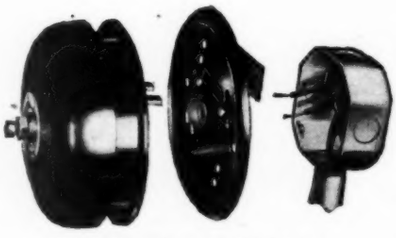


G-E LIMIT SWITCH

Limit Switches

Two new forms have been added to the G-E line of CR9441-C2 rotating-type limit switches. One form is for Class 1, Group D hazardous gas locations and the other is for applications requiring a water-tight switch. Switches are housed in heavy, flanged, cast-iron enclosures. Mechanism is adjusted to operate contacts between a minimum of one-half turn of the driving shaft and a maximum of 120 turns. Double-break, silver contacts clean themselves by opening and closing with a rocking motion. One double-break contact is located at each end of travel, and can be made normally closed or opened without additional parts. General Electric Co., Schenectady, N. Y.

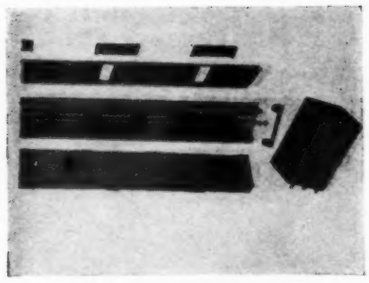
■



SCHWARZE UNI-PACT BELL

Industrial Signal

This new industrial signal is known as Uni-Pact Bell. It is available in a.c. and d.c. types. The selenium rectifier, an integral part of the a.c. mechanism, eliminates permanent magnets, it is claimed. The design of both types eliminates hinged armature with its bearings and bushings. It has a dead front adapter plate that can be mounted on any standard outlet box. Into this the bell unit is plugged. Schwarze Electric Company, Adrian, Mich.



WESTINGHOUSE BUS DUCT

Bus Duct

This new bus duct is for industrial secondary power distribution systems. Units are of the plug-in and feeder types. Unit is composed of copper busses, Prestite separators, and dust-tight metal enclosure. Available in ratings of from 250 through 1500 amperes. At currents below 1500 amperes, hot rolled sheet steel is used; at values of 1500 amperes or above, a feeder duct of different construction is available. Plug-in sections are supplied in 10-foot line units with outlet service staggered every 12 inches along a run. To install, the bus duct is hung by narrow double-strap hangers either edgewise or flatwise, depending on availability of plug-in. Where suspension rods are used, fastening is made to any convenient overhead suspension point and an adjustable cantilever clamp slides along duct to point of alignment. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

■

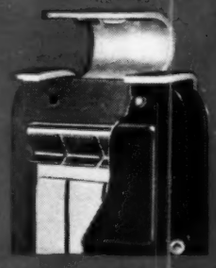
Revolving Field Generators

These revolving field alternating current generators are for continuous duty in isolated plants or to supplement other available power supply. Available in sizes from 7½ to 75 kva.—4, 6 or 8 pole, 1800, 1200 or 900 rpm., 60 cycle, for belt or coupling drive or flange mounting. They are wound for various standard voltages—single phase 2 and 3 wire, three phase 3 and 4 wire or two phase 4 wire. The neutral may be brought out for three phase 4 wire systems for light and power. They are built to meet AIEE and NEMA voltage regulation standards. They can be designed for any desired value of power factor, but the regulation will be governed by the power factor. Century Electric Co., 1806 Pine Street, St. Louis, Mo.

CENTURY ELECTRIC GENERATOR

SETS A NEW STANDARD
in Safety Switch Design
THE NEW *Vacu-Break* SAFETY SWITCH

Note streamlined appearance, and push-type, front-operated rocker handle inside cabinet lines. Below: New Type Arcing Chambers are attached to Overhead Brackets that in turn ride on the operating lever which transmits an over-center, straight line, push-and-pull motion to switch contact heads.



Cut-away view of new formed bakelite arcing chamber shows how snugly the clamping pressure contacts fit therein.

WITH "*Clampmatic*" CONTACTS AND FRONT-OPERATED ROCKER HANDLES

Get acquainted with the quality switch of the day — the new BullDog Vacu-Break Safety Switch. This new switch, with its "clampmatic" contacts and front-operated rocker handles sets an absolutely new standard in safety switch design.

The handsome, streamlined appearance of the new Vacu-Break Switch; its new, simplified operating mechanism; its perfect clamp pressure yet almost automatic ease of operation; its new, push-type rocker handle inside cabinet lines; all combine to offer you something unique in switch design and in performance.

The new *"Clampmatic"* Clamp Pressure Contacts, and the new snap spring Rocker Handle of the *push* type, assure perfect clamp pressure of the switch contacts while in the ON position combined with almost automatic ease in "making" or "breaking" the circuit.

Write for complete illustrated Bulletin No. 415.

OUTSTANDING FOR ITS EXTREME SIMPLICITY OF DESIGN

BULLDOG ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN

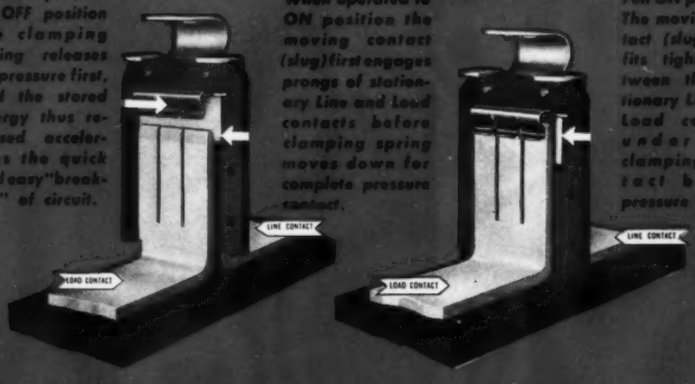
BULLDOG ELECTRIC PRODUCTS OF CANADA, Ltd.
TORONTO, ONTARIO

MANUFACTURERS OF Vacu-Break Safety Switches, SafToFuse Panelboards, Circuit Master Breakers, Switchboards, Bus Duct Systems—FOR LIGHT AND POWER

When operated to OFF position the clamping spring releases its pressure first, and the stored energy thus released accelerates the quick and easy "breaking" of circuit.

When operated to ON position the moving contact (slug) first engages prongs of stationary Line and Load contacts before clamping spring moves down for complete pressure contact.

Full ON position. The moving contact (slug) now fits tightly between the stationary Line and Load contacts under full clamping contact by the pressure spring.



Above: Two views of a 200 amp. Switch Head with bakelite cover removed, illustrating the "Clampmatic" principle of pressure contacts.

LOAD-CENTER DISTRIBUTION

The NEW *and* BETTER *to distribute* ELECTRIC

• IN INDUSTRIAL PLANTS
• IN NAVAL AND MILITARY PROJECTS
• IN COMMERCIAL BUILDINGS

HERE'S the answer to the pressing problem of providing reliable electric power distribution quickly and economically in today's rapidly expanding plants—the LOAD-CENTER distribution system.

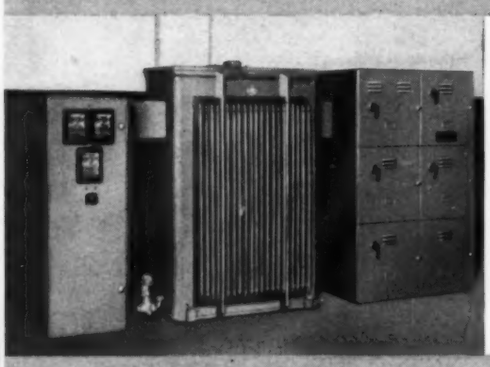
Using load-center power distribution, you can install a *better* distribution system in several weeks less time, at lower over-all cost, and with far less copper and other vital materials than are required for an old-style distribution system. Furthermore, the flexibility of your electric system is increased, engineering and planning time is reduced, and purchasing is considerably simplified.

The system's basic element, the *load-center unit substation* (consisting of a metal-clad incoming-line section, a Pyranol* transformer section, and a low-voltage feeder section with drawout air circuit breakers) is a compact, factory-built, entirely coordinated unit. It's delivered ready to install right in the same room with the machinery to be supplied with power. Thus, you can add substation capacity WHEN you want it and WHERE you need it, largely eliminating the high cost of long, heavy, low-voltage circuits from a distant substation. Voltage drop, too, is greatly reduced, thus improving the performance of your electric equipment.

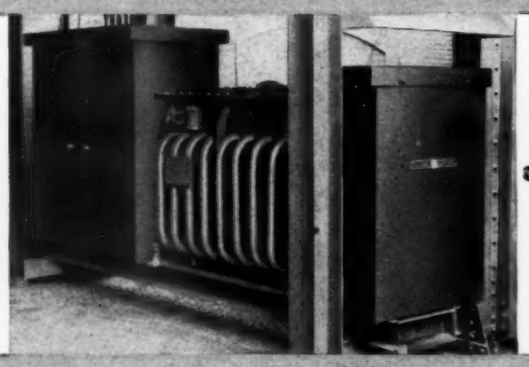
*PYRANOL is G.E.'s trade-mark for a nonsludging, insulating and cooling liquid that will not burn.

SAVES *TIME, MONEY, AND VITAL MATERIALS*

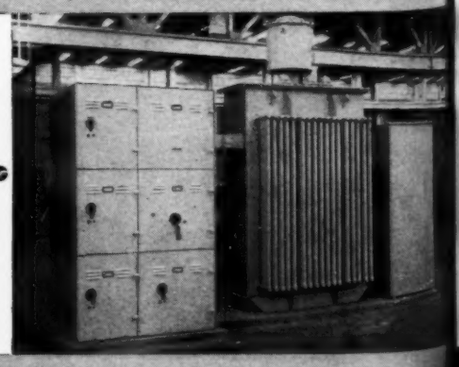
LOAD-CENTER UNIT SUBSTATIONS



Load-center unit substations, basic element of the G-E load-center distribution system, are quickly and easily installed (either indoors or outdoors) at comparatively low cost. And they're entirely metal-enclosed for increased safety.

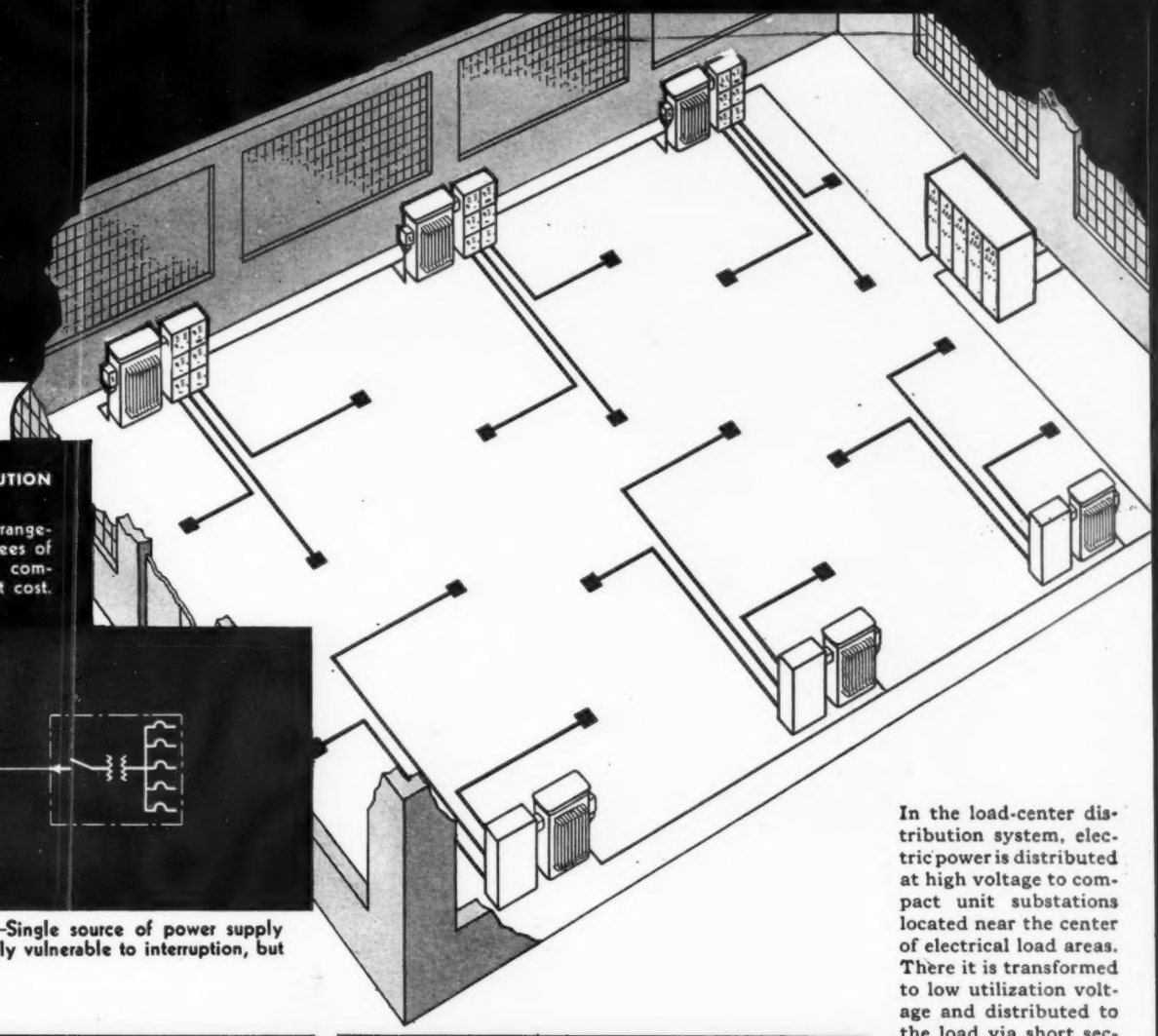


These compact unit substations can be located almost anywhere; this outdoor unit is tucked away beneath a large factory building. As load centers change, units can be easily moved to new locations.



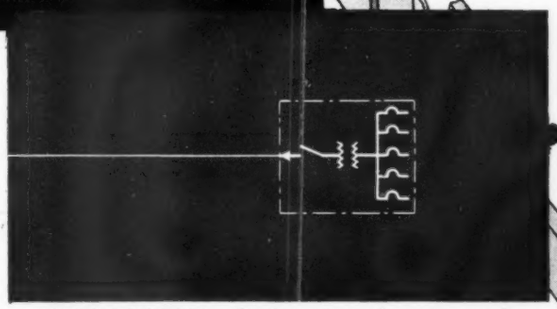
Skid your load-center unit substation into position, make the necessary connections, and it's ready for service. Noninflammable Pyranol means that units can be located right in the same room with machinery without expensive vault construction.

WAY POWER



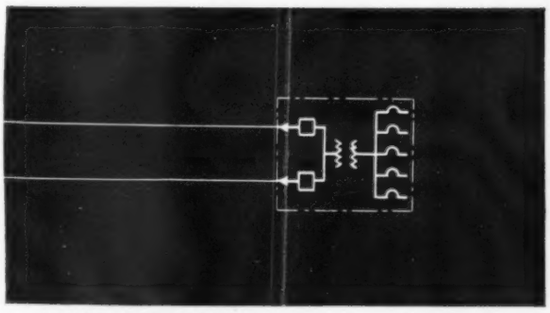
LOAD-CENTER DISTRIBUTION IS FLEXIBLE

Four basic circuit arrangements offer various degrees of service reliability with comparable variations in first cost.

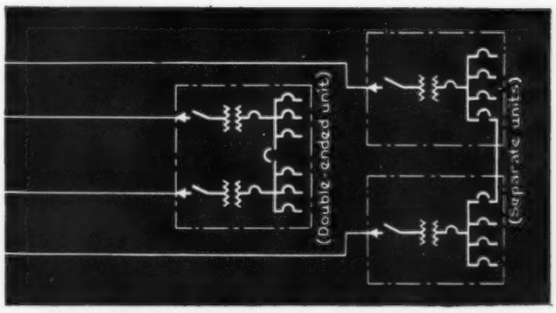


SIMPLE RADIAL—Single source of power supply makes it comparatively vulnerable to interruption, but also least expensive.

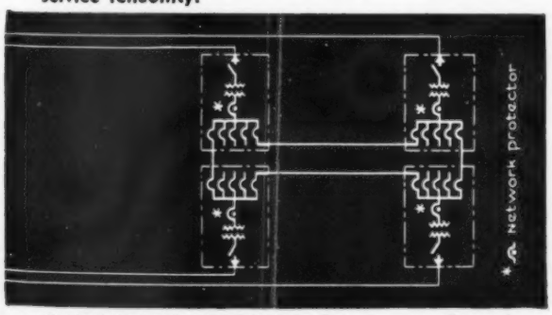
In the load-center distribution system, electric power is distributed at high voltage to compact unit substations located near the center of electrical load areas. There it is transformed to low utilization voltage and distributed to the load via short secondary feeders; thus, you avoid the high cost and voltage drop of long, heavy low-voltage feeders from a distant substation.



PRIMARY SELECTIVE—Two sources of power supply mean an alternate source is available should a fault occur on one primary feeder, thus increasing service reliability.



SECONDARY SELECTIVE—Two sources of supply, interconnected in the secondary, provide an alternate supply in case of an interruption in either a primary feeder or secondary transformer.



SECONDARY NETWORK—Two sources of supply with all transformers operated in parallel on the secondary. A faulty primary feeder or secondary transformer is automatically disconnected. (Highest degree of service reliability.)

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

FOR THE ENTIRE STORY

General Electric Co., Section D302–1
Schenectady, N. Y.

Send me your Bulletin GEA-3758, "Load-center Power Distribution," which describes in detail how the load-center system saves time, money, and vital materials.

Name.....

Company.....

Address.....

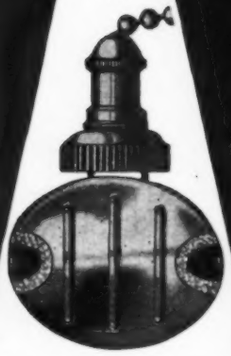
City.....State.....

302-1

GENERAL ELECTRIC

LEVOLIER SWITCHES
FOR
F.H.P. Motors
Individual Light Control

No. 41



You save trouble and expense with McGILL Levolier Switches. In our testing they have stood up for over 194,000 "off-and-on" pulls. They are ideal for Fractional H. P. Motors or Individual Light Control. The No. 41 is only 5/8" thick. It is used in commercial and industrial buildings.

The No. 1010 is a 10-amp., 125-volt, lever-controlled switch, and listed by the Underwriters with a "T" rating; capable of taking an initial surge of 80 amps, or 8 times its rated capacity. Dimensions, 7/8" thick, by 1 3/4" diameter. Can be had with 7' cord, chain with bell ends or plain lever.

No. 1010

ELECTRICAL DIVISION
McGILL
MANUFACTURING CO.
VALPARAISO, INDIANA

EQUIPMENT News

[FROM PAGE 100]

Instrument

An electronically operated, high sensitivity, multi-purpose meter instrument, known as "Electronic Multitester" has been announced. It has many applications in radio and electrical measurement work. It provides a total of 27 measurement ranges to take care of voltages, both a.c. and d.c. up to 6,000 volts; resistance to 1,000 meghoms; capacities to 2,000 microfarads. Any one of these ranges is selected by means of two rotary switches, one of which selects type of measurement desired, the other the numerical range. Its vacuum-tube and power supply circuits are built-in and operating power is drawn from any 105-130 volt line. Radio City Products Co., 88 Park Place, New York, N. Y.

R.C.P. ELECTRONIC MULTITESTER

■

G-E OIL-LEVEL RELAY

Relay

A new oil-level relay for oil-filled cable has been announced. The relay is intended for use with gravity-feed-type reservoirs. All wiring is enclosed in oil-free compartment. The coupling between the float and operating mechanism is magnetic. The alarm switch is indirectly controlled by a hollow steel ball, which fits inside the walls of a cylinder-shaped chamber enclosed in a non-magnetic housing. At its lowest point, the ball actuates a magnet which pulls down a hinged arm, causing the alarm switch to close. General Electric Co., Schenectady, N. Y.

TORK

TURN ANYTHING ELECTRICAL ON & OFF REGULARLY

Four Little Giant Models

Self-Starting

Ratchet Setting Dial; One Minute Accuracy; Hinged Cover; Lots of Room; 12 Knock-outs; 1 R.P.M. Indicator

		List
191 A	—Single Pole, 20 Amp.	$13.00
1191	—Single Pole, 35 Amp.	14.00
962 A	—Double Pole, 20 A. ea	15.00
1962	—Double Pole, 35 A. ea	16.00
Apt. House, 2-S.P. Circuits		25.00

Sixty Minute and Four Hour Timers

CARRIED BY JOBBERS EVERYWHERE
The TORK CLOCK CO., Inc.
MOUNT VERNON, NEW YORK

BADGER
Synchronous
ELECTRIC TIME SWITCHES

CONTRACTORS LIKE THEM BECAUSE:
they are dependable and easy to install

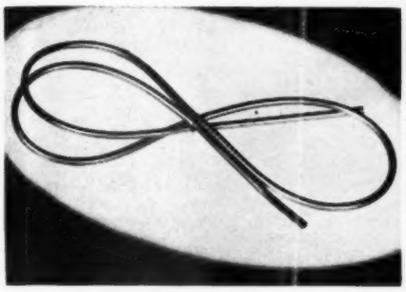
USERS LIKE THEM BECAUSE:
of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

RELIANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET RACINE, WISCONSIN

Plastic Tubing

A new plastic tubing for electrical insulation, known as Turbo extruded tubing, has been developed. This new sleeve insulation has resistance to low temperature (30 to 40 degrees below zero) and possesses high dielectric strength of approximately 23,800 volts. The tensile strength is rated at 3,140 lbs. per sq. inch. Its moisture absorption factor is less than one-half of one per cent in 24 hours of water immersion. Other characteristics are its resiliency



BRAND PLASTIC TUBING

and its ability to retain original shape and size regardless of reasonable subjection to hot and cold variations. Material is available in a variety of colors, in standard ASTM diameters of 36 inch lengths or in coils of continuous length in minimum lengths of 25 feet. William Brand & Co., 276 Fourth Avenue, New York, N. Y.

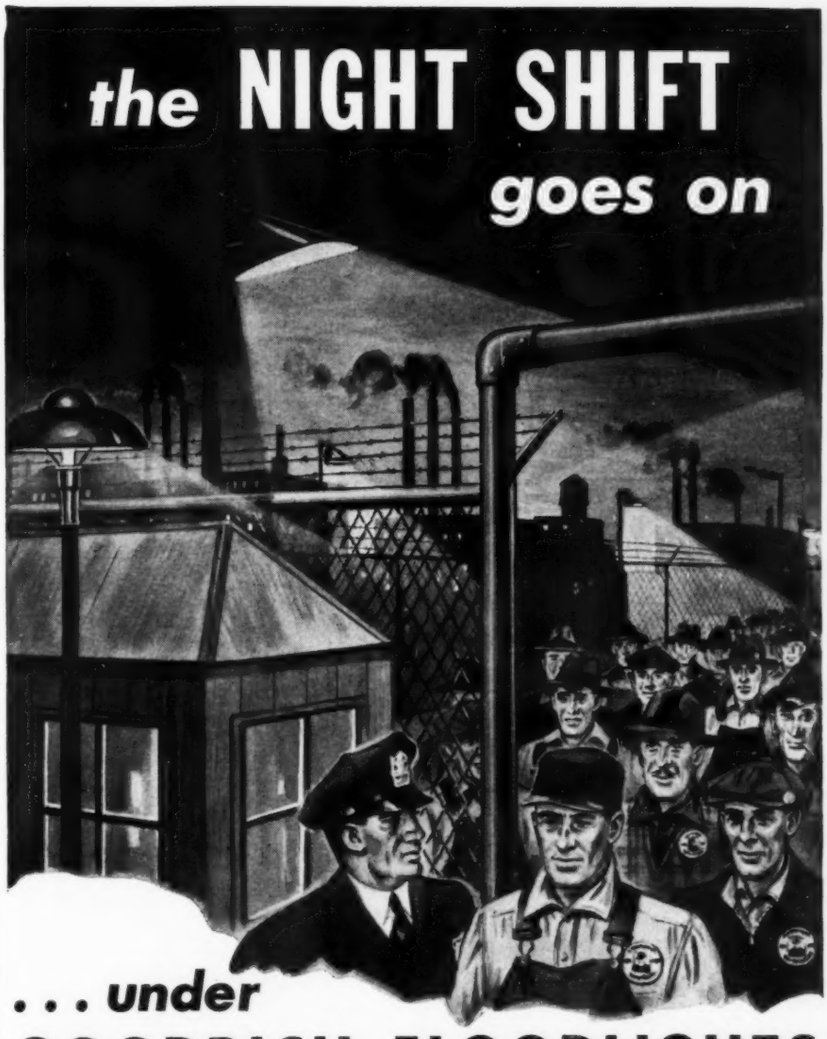
■

Mercury Switch

This new mercury switch consists of a metallic cartridge in two parts, sealed together and pressed into a tube of insulating material. It is then sealed again with lead wires, any length, soldered direct to the metallic cartridge which is filled with inert gas under pressure. It is made in

BACON MERCURY SWITCH

single or double throw types. The switch is unbreakable. It has mercury to mercury contacts. It is designed for use in timing equipment. Bacon Electric Timer Corporation, 4513 Brooklyn Avenue, Cleveland, Ohio.



. . . under
GOODRICH FLOODLIGHTS

● Here they come—chins up, with the will to win—these men who fight the night battles of production! Nothing must interfere with their work; nothing must slow them in this race to arm America—quickly!

During these critical nights, floodlighting is indispensable around defense plants. For bright illumination is essential to quick and positive identification . . . to prevent the sly approach of saboteurs who seek to interfere with the swift flow of production.

All over America, Goodrich Floodlights are performing this important service in the interests of National Defense. Those seeking helpful information on the subject of protective lighting should write us for Folder No. 101, *"Plant Protection."*

GOODRICH
INDUSTRIAL LIGHTING

RLM

Diffuso Floodlight

Standlite

The complete Goodrich line includes all sizes and styles of incandescent and fluorescent fixtures to meet every industrial requirement. Ask for literature.

SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4602 BELLE PLAINE AVENUE, CHICAGO, ILL.

Ward Leonard Controls
for over fifty years have contributed their part in increasing safety, comfort, and efficiency of our men in the service.

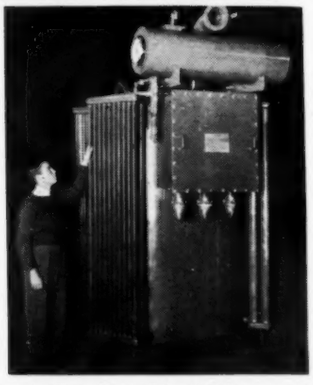
FRESH AIR
below decks

Clean air at endurable temperatures is essential for men in congested quarters. Aboard ships, in barracks, and in shops, air conditioning assumes a new importance. Ward Leonard's contribution is electric controls. Ward Leonard provides automatic switches to regulate the flow of coolants. Ward Leonard builds motor starters for controlling both pumps and blowers. Ward Leonard Engineers are continuously developing and producing special purpose controls for air conditioning, refrigeration, and other essential equipment.

WARD LEONARD
Electric control (WL) *devices since 1892.*

WARD LEONARD ELECTRIC COMPANY, 28 South Street, Mount Vernon, New York

UPTEGRAFF *Power* TRANSFORMERS



For war production, the outstandingly rugged construction of Uptegraff Power Transformers is well serving the nation. Tell us your immediate requirements.

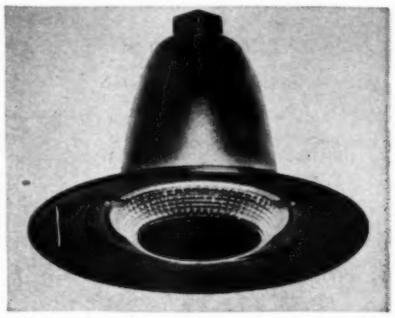
R. E. UPTEGRAFF *Manufacturing Co.*
SCOTTDALE · · · PENN'A · U.S.A.

EQUIPMENT *News*

[FROM PAGE 105]

Blackout Light

This new blackout lighting unit is of the suspension type. It consists of a one-piece crystal glass refractor and cast-iron fitter. When used with a six-watt S-14 bulb, with 100-ft. spacing between units and a 20-ft. mounting height, it gives an illumination range of 0.0002 to 0.0004 foot-candles on the horizontal plane. Maximum candle-power does not exceed 2.0 at all angles below and including 90 deg. The unit follows the requirements of the British Air Raid Precaution Specification. Holophane Co., Inc., 342 Madison Avenue, New York, N. Y.



HOLOPHANE BLACKLIGHT LIGHT

■

Rheostat Cages

A variety of rheostat cages have been developed for use with Ohmite rheostats. A cage enclosure is a form of table top or surface mounting and is advisable where there is possibility of mechanical injury to rheostats or human contact with electrically "live" parts. Surface mounting cages are used with fractional hp. motor controls; heating device controls; on dental and medical equipment and for use in laboratories. The types available are ventilated cages with perforated sides, dust-proof cages; cages to house rheostats in tandem; explosion proof cages; ventilated cages with one-half closed as a splash guard and laboratory type semi-enclosed table-top cage. Ohmite Manufacturing Co., 4835 Flournoy Street, Chicago, Ill.

OHMITE RHEOSTAT CAGE

A WAR MESSAGE
to
ALL EMPLOYERS

★ From the United States Treasury Department ★

WINNING THIS WAR is going to take the mightiest effort America has ever made—in men, in materials, and in money! Every dollar, every dime that is not urgently needed for the civilian necessities of food, clothing, and shelter, must, if we are to secure final Victory, be put into the war effort.

An important part of the billions required to produce the planes, tanks, ships, and guns our Army and Navy need must come from the sale of Defense Bonds. Only by regular, week by week, pay-day by pay-day investment of the American people can this be done.

This is the American way to win. This is the way to preserve our democratic way of life.

Facing these facts, your Government needs, urgently, your cooperation with your employees in *immediately* enrolling them in a

PAY-ROLL SAVINGS PLAN

The Pay-Roll Savings Plan is simple and efficient. It provides, simply, for regular purchases by your employees of United States Defense Bonds through systematic—yet voluntary—pay-roll allotments. All you do is hold the total funds collected from these pay-roll allotments in a separate account and deliver a Defense Bond to the employee each time his allotments accumulate to an amount sufficient to purchase a Bond.

The Pay-Roll Savings Plan has the approval of the American Federation of Labor, the Congress for Industrial Organization, and the Railroad Brotherhoods. It is now in effect in several thousand companies varying in number of employees from 3 to over 10,000.

In sending the coupon below, you are under no obligation, other than your own interest in the future of your country, to install the Plan after you have given it your consideration. You will receive—1, a booklet describing how the Plan works; 2, samples of free literature furnished to companies installing the Plan; 3, a sample employee Pay-Roll Savings authorization card; and 4, the name of your State Defense Bond administrator who can supply experienced aid in setting up the Plan.

To get full facts, send the coupon below —today! Or write, Treasury Department, Section B, 709 Twelfth St., NW., Washington, D. C.

HOW THE PAY-ROLL SAVINGS PLAN HELPS YOUR COUNTRY

1. It provides immediate cash now to produce the finest, deadliest fighting equipment an Army and Navy ever needed to win.
2. It gives every American wage earner the opportunity for financial participation in National Defense.
3. By storing up wages, it will reduce the current demand for consumer goods while they are scarce, thus retarding inflation.
4. It reduces the percentage of Defense financing that must be placed with banks, thus putting our emergency financing on a sounder basis.
5. It builds a reserve buying power for the post-war purchase of civilian goods to keep our factories running after the war.
6. It helps your employees provide for their future.

MAIL THIS COUPON NOW

Treasury Department, Section B
709–12th St., NW.
Washington, D. C.

We want to do our part. Please rush full information regarding the Pay-Roll Savings Plan.

NAME .....

POSITION .....

COMPANY NAME .....

ADDRESS .....

NUMBER OF EMPLOYEES .....

MAKE EVERY PAY-DAY . . . BOND DAY!

U. S. Defense BONDS ★ STAMPS

This space is a contribution to NATIONAL DEFENSE by ELECTRICAL CONTRACTING

GPO 16—25943-1 Form No. DSS-BP-2

Keep Motors Humming
on 24 Hour
PRODUCTION SCHEDULES

WARE Hi-Lag FUSES meet Federal Specfications WF-803 — Type II. Time-lag 2 to 5 times normal current handles heavy starting overloads and operating current surges.

Low Contact Resistance, ends fuse over-heating worries.

Larger, Heavier internal construction assures continuous uninterrupted service.

Write for Bulletin FK-8

APPROVED BY UNDERWRITERS

WARE BROTHERS
4410 W. Lake St. Chicago, Ill.

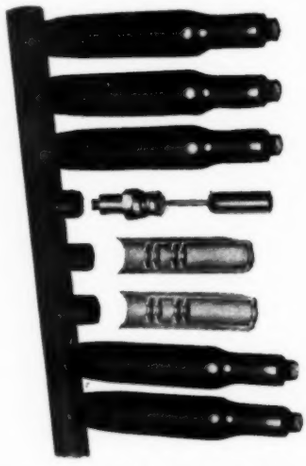
WARE
Renewable
HI-LAG FUSES

EQUIPMENT News

[FROM PAGE 106]

Connector

A new type of insulated connector designed for use in junction or limiter boxes of industrial secondary networks has been announced. It provides a simple and compact means of interconnecting the ties of the network, joining the ties to the network transformers, and tapping off any number of loads. The special Mole consists of central conducting body, surrounded by molded insulating jacket and containing any number of cable outlets. To isolate faulty ties or faults in any of the joining cables, each outlet is provided with a Molimeter. Some of the advantages are—prevents damage to other parts of the system; Mole assembly protects power supply from interference by sabotage; insulation offers protection against short circuits. Mole is available in many types. Type ZMEJ has extended ends, which enable connector to be supported on grooved insulating strips mounted in limiter box. Burndy Engineering Co., Inc., 107 Eastern Boulevard, New York, N. Y.



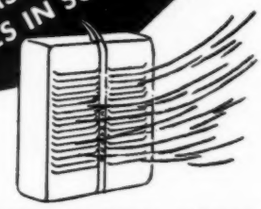
BURNDY INDUSTRIAL NETWORK CONNECTOR

■

Pipe Insulator

A corrosion- and leak-resistant pipe insulator has been developed for cable systems which require insulation between cable sheaths or joint casings and oil supply reservoirs connected to joints and terminals. Small annular channels are provided in plastic portion of insulator. Into these are molded gaskets of C-1000 rubber. These rubber gaskets form a tight seal between plastic and brass of inserts, preventing development of any leak because of differential expansion and contraction. General Electric Co., Schenectady, N. Y.

THERMADOR
Fan-type Portable Heater
WARMS IN WINTER
COOLS IN SUMMER

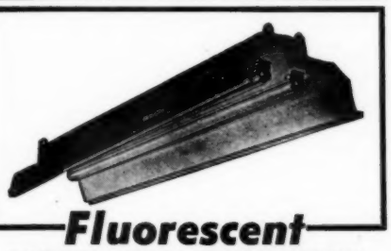


ANSWERS INDUSTRIAL HEATING PROBLEMS

Watch efficiency and production soar when you install Thermador Portable Electric Heaters. Enclosed fan forces out comforting warmth or circulates refreshing, cooling air. Light, compact, portable, may be moved about plant or office with minimum of effort.

Equipped with four-position switch: cool, half heat, full heat, off. 8 feet of cord and polarity plug. 230 Volts —50 or 60 cycles A.C., Single Phase. Sizes to 5000 Watts. Write for prices and specifications.

THERMADOR
5119 SO. RIVERSIDE DRIVE, LOS ANGELES, CALIF.
230 MADISON STREET, OAKLAND, CALIFORNIA



Fluorescent
MEET ALL DEMANDS
with
MULTI
REFLECTORS

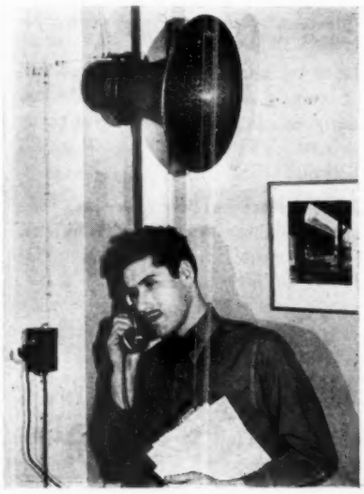
Incandescent

No two installations require the same kind of fixture—that's why contractors rely on the MULTI line to always fill the bill. Whether they need Fluorescents or Incandescents—for commercial, industrial, or residential lighting, they can get the unit best suited to the job from the MULTI line. Send for our complete catalog.

MULTI
ELECTRICAL MANUFACTURING CO.
1840 W. 14th ST., CHICAGO, ILL.

Industrial Paging Systems

A new two-way communication system, permitting paging messages to be originated from any station and broadcast to all stations, with the addition of private, two-way telephone-type conversations between any two or more points has been developed. It accommodates from 2 to 70 stations. Any person desiring to locate and converse with another person approaches the nearest station and talks into mouthpiece of a telephone-type handset. Trumpet speakers at all other stations announce the call. When system is in use, a busy-signal light automatically flashes on all stations. Executone, Inc., 415 Lexington Ave., New York, N. Y.

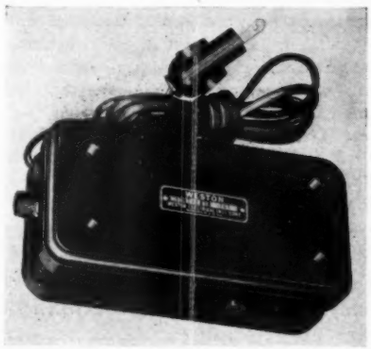


EXECUTONE COMMUNICATING SYSTEM

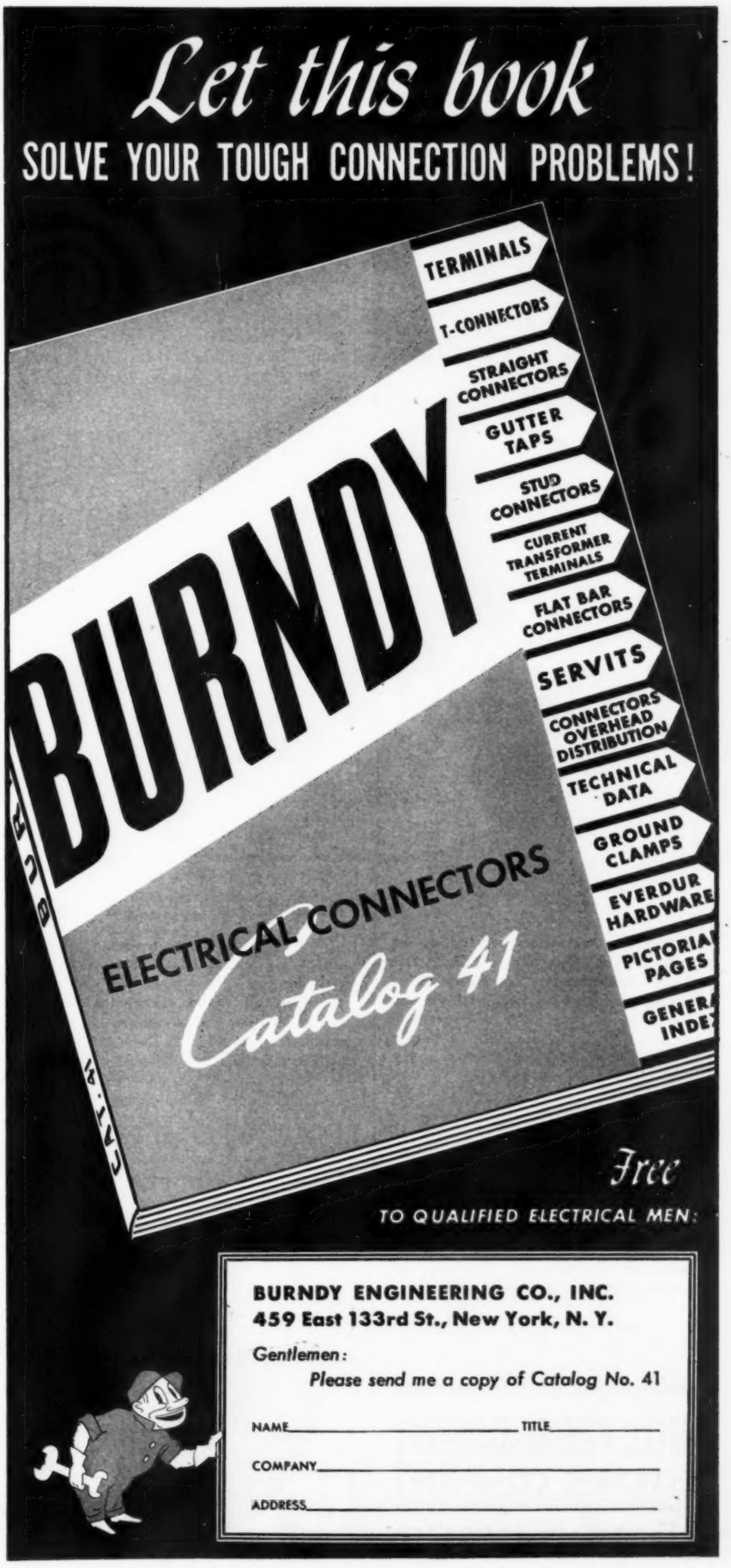
■

Insulation Tester

The new Model 792 insulation and cable covering resistance tester is designed to adapt the Weston Model 785 industrial circuit tester or Model 772 test analyzer for measurement of insulation resistance up to 900 megohms. It fits into compartment of Model 785 and operates from a 100-130 volt a.c. 50-60 cycle supply line. It is connected into ohmmeter circuit of these models by a pair of leads and the insulation resistance measurement read on the ohmmeter scale. Measurements up to a value of 900 megohms are made at a test potential of 500 volts. Weston Electrical Instrument Corp., Newark, N. J.



WESTON INSULATION TESTER



To help win this war, industry must go all-out against the menace of fire which could obstruct and sabotage defense efforts. For this reason Holtzer-Cabot has designed Fire Alarm Systems for defense plants, especially the smaller ones.

Master Code Fire Alarm Station Break Glass, Double Operation Type For Surface Mounting.

Electrical contractors are finding the new Holtzer-Cabot Master Code Fire Alarm Systems ideal for safeguarding plants against production delays and losses in man-hours. It is convenient to install, easy to maintain. Action is positive, instantaneous. Double operation resists tampering.

Here is a priority item that is a "must" for every plant in need of effective protection against the spread of fire.

Holtzer-Cabot will furnish you with all the information and engineering data you may need. Sales aids and technical literature will help you sell easier, install easier.

Write for Bulletin 163-MC-1

THE

HOLTZER-CABOT

ELECTRIC COMPANY

Manufacturers of Signaling System

125 Amory St., Boston, Mass.

EQUIPMENT News

[FROM PAGE 109]

Lock for Fluorescent Lamps

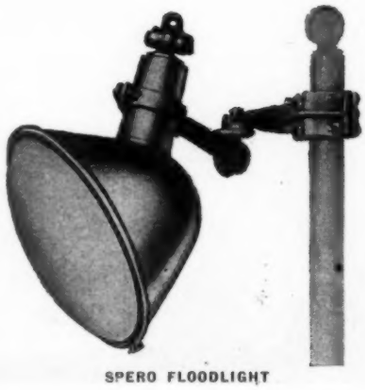
The new Flur-O-Lock is a device for locking fluorescent lamps against vibration. It is claimed to prevent premature lamp failure; loosened lamps; accident hazards and costly lamp replacements. It is for 10 to 40 watt fluorescent lamps, single slot sockets. To install, place one lock on contact prongs at each end of lamp. Set lamp in sockets. Insert keys in socket slots. Laduby Company, New Haven, Conn.

LADUBY FLUR-O-LOCK

■

Floodlight

These floodlights are designed for high intensity lighting on fields, work areas, parking lots, etc. They are available in the open type or the enclosed weatherproof type. Enclosed type floodlights are equipped with Prismatic lens. Units are furnished with cast bracket or both vertical and horizontal adjustment to be mounted on two inch pipe. Bracket can also be furnished for cross arm or wall mounting. Units available for 300, 500, 750 and 1500 lamp sizes. The Spero Electric Corporation, 18222 Lanken Avenue, Cleveland, Ohio.



SPERO FLOODLIGHT

Is It Useful?

Decide for yourself—check the following features of the Electrical Buyers Reference.

- ☐ **Condensed catalogs of 260 manufacturers. Not a jumbled pile of loose pamphlets, but one solid, page-after-page section.**
- ☐ **146 big pages of product-classified listings of 3500 manufacturers; the "who makes it" section.**
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- ☐ **Company names, trade names, street addresses . . . over 6000 listings.**
- ☐ **Everything up-to-date, and edited for 1942 use!**

Or a total of 537 pages packed full of buying and specifying information, all in one handy, ever-ready volume: ELECTRICAL BUYERS REFERENCE.

Active electrical men say it's the most valuable volume in their offices. Use it yourself . . . it's *your first source of information.*

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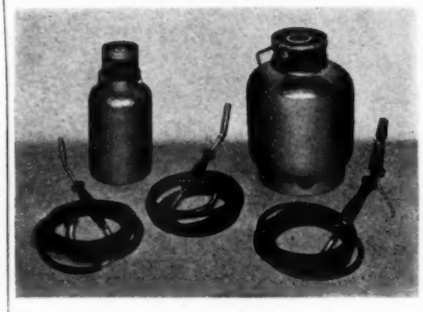
★ Insto-gas ★



Fast, SAFE Torches for ALL Electrical Work!

Here's the equipment for your Victory speed-up program—to handle ALL electrical work and refrigeration soldering. For example, Insto-gas Torch No. 1 makes a pencil flame ideal wherever a clean, constant, hot, pointed flame is required. Gets into tight spots. Does not burn insulation. All Insto-out. Light-Weight Torches for all sizes of work.

Mail Coupon or Write TODAY

INSTO-GAS CORP., 1906 E. Jefferson, Detroit

Send complete information on torches and furnaces and name of nearest distributor.

Name .....

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.....

[FROM PAGE 26]

were 19 lighting circuits. Additional ones totalling 23 were added for the new lighting system. The new circuiting consists of four 4-ft. fixtures per circuit. The units were installed over existing outlets and the unused ones were capped.

Flexible Switching

The continuous rows are controlled by local switches mounted on the columns. The large existing conduits permitted the installation of six "Despard" switches per column which control the fixtures in groups of four. There are two switches for each group—one controls the two outside lamps of the unit and the other controls the two inside lamps. Thus, either one half or full capacity of the system can be utilized as desired.

In the case of two of the private offices, fluorescent cove lighting was installed in a continuous cove around the room. To eliminate the time lag and the necessity of operating a number of switches to illuminate the cove, remote control contactors were installed. These contactors operated by a switch in the office, are installed in the sectionalized lighting panel and operate the required number of circuits to feed the entire cove. In other offices, research units were installed in one or two row patterns, as shown in the accompanying diagram. The spacing is varied according to the room dimensions.

Resultant Intensity

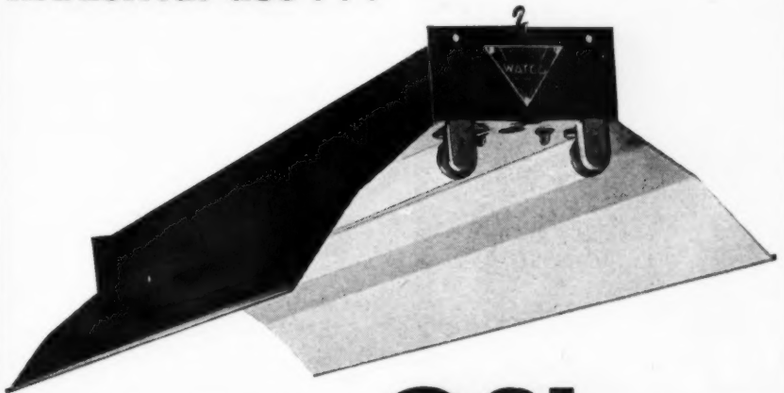
The resultant intensities, after several months operation are 68 foot-candles with all four lamps per fixture in use. If only two lamps per unit are used, the intensity drops down to approximately 34 footcandles.

Little need be said about the resultant efficiencies of those who work under this light. They are obvious. Files and figures can be located and read with increased facility and mistakes are reduced considerably. A general speed-up in work accomplished tells the story. The company president's reactions were conveyed to the Hyre Electric Co. in two words—"It's Perfect".

The lighting of this office is typical of what can be done in hundreds of plant offices today. If we are to go all-out in our effort to obtain Victory in this war —we've got to go all-out in our efforts to increase the production of both the man behind the lathe and the girl behind the typewriter. Modern lighting is one way of doing it.

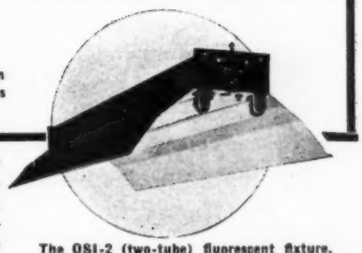
WATCO ANNOUNCES:—

. . . A Fluorescent Fixture SPECIALLY DESIGNED* for 24-hours-a-day, 7 days a week industrial use . . .



THE NEW OSI UNIT

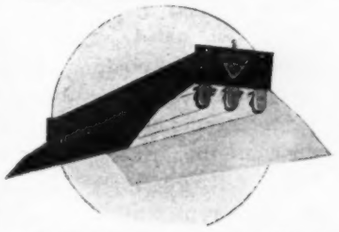
*The easily removable reflector allows you to keep fixtures in continuous use, by having one extra reflector—the OSI assures MAXIMUM UTILITY through INTERCHANGEABILITY!



The OSI-2 (two-tube) fluorescent fixture, showing thumb screws that permit removing of reflector.

In tune with the times, WATCO has brought out a new fluorescent fixture that's ideal for the strenuous working schedules now in force—*the OSI unit.* With its easily removable and interchangeable reflector, an installation of OSI fixtures, with one extra reflector, can be on the job all the time . . . giving the vital light so necessary for precise industrial operations.

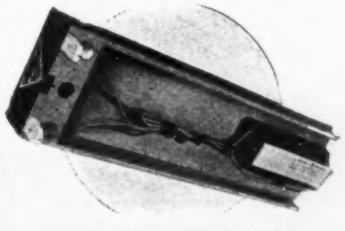
The OSI is available in two models—the two tube and the three tube. The two tube unit is so constructed that the third-tube can be easily added. Reflector and body of both are of 20 gauge steel —interior finished in white enamel—exterior, light gray enamel. Ends are open for greater spread of light—Holes for rod connection provided on both ends of top of unit—"S" hooks for hanging provided, but no chains or rods. Tulamp high power-factor ballast, with only E.T.L. approved equipment used.



The OSI-3 (three-tube) fluorescent fixture, a conversion of the two-tube unit, which increases efficiency 27% over the OSI-2.

Here, then, is a low priced, highly efficient unit that meets the needs of industry from every respect. Make it your choice for industrial installations of all kinds, and always make WATCO your choice for:

Every Type of Commercial Fluorescent Fixture . . . Draft-O-Lamps, the Scientifically correct fluorescent unit for drafting rooms . . . other special fluorescent fixtures.



OSI fixture with reflector removed, showing accessibility of wiring and location of holes for accommodation of third tube.

THE OSI UNIT IS AVAILABLE FOR IMMEDIATE DELIVERY — WRITE, WIRE OR PHONE TODAY!

WATCO Engineering Inc.

12435 EUCLID AVE., CLEVELAND . . . OHIO

An old campaigner at speeding production

—AND A *VETERAN SALES-BUILDER*

AGAIN, as in World War I, P-A-X automatic interior telephones are helping to speed and simplify war production. By selling this fast, dependable interior communication equipment you're helping to increase vital production—and at the same time you're opening up new profit opportunities for yourself!

Many of your customers whose work is tied into the war effort can speed production—lower costs, by using P-A-X automatic telephones for interior communication. Give them *all* the facts. If you need help, call on the Automatic Electric representative nearest you. He will be glad to work with you.

These systems are designed for private service. They are not intended to be connected with the public telephone system.

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Canadian Telephones & Supplies, Ltd.,
Toronto, Ont.

Lightning Protection

[FROM PAGE 23]

with earth and look somewhat like a mound of dirt. Each of these igloos is provided with lightning rod aerials, the number depending on the length of the unit. Rods are spaced on 20-ft. centers and no less than two are used per unit.

The aerials are mounted in a special reinforced concrete pedestal which projects a few inches above the earth fill over the igloo. In some plants these rods are connected to a series of No. 1/0 arch conductor which intertwine among the reinforcing steel and finally connect to a ring of copper conductor which ties in to ground rods at each corner of the igloo.

Lately, however, to conserve as much copper as possible, these arch cables have been eliminated and the reinforcing steel cage has been welded together to form an electrically continuous circuit for conducting current. This welded cage is shown in section in Figure 3. By doing this the copper ring was eliminated and only one ground rod at each of the four corners was necessary in most cases. If soil conditions required it, a counterpoise and multiple ground rods were installed.

Chromium plated points are threaded to copper rods. The detail of the rod pedestal which connects to the welded igloo cage is shown in Figure 4.

The Above-Ground Units

Those buildings that are constructed above ground are generally built of structural steel and corrugated sheet steel or asbestos roof and siding. The lightning protection system for these buildings consists of numerous aerials as outlined under the general system. In these units, however, a ring of buried copper cable surrounds the building and branch ties go to the building to bond the steel, siding, windows, doors, reinforcing mesh, and all other metal objects. Sectional and plan views showing the grounding system for this type of units are found in Figure 1.

Simple Installation

The installation of lightning protection equipment is not as hard as it seems. All equipment is of special type for this particular use, as can be seen in Figure 2. The aerials and cable supports are fastened to the roof by sheradized iron bolts and make a good electrical connection. Cable clamps are mounted in the same manner and squeezed over the cable with a special tool. Cable supports are spaced every four feet. Special connectors are used to fasten the down conductor to roof gutters, tie in conductors above and below grade and fasten to ground rods. Each down conductor is mechanically protected for a distance of 8-ft. above the floor or ground to prevent displacement. All connections are of the solderless pressure or set screw type.

Protection is Important

The importance placed on lightning protection is evidenced by the fact that the government is spending millions of dollars for just such protection in its ordnance plants. What about industry in general? It's true that in most cases the boiler stacks, water tanks and highest points may be grounded. But, today, when industrial plants cover hundreds of acres, it might be well to consider a more complete lightning protection system. Plants subcontracting for defense orders might well consider it. It's one system that can be installed in existing buildings without tearing them apart. Most of the work is external. And remember lightning can halt production just as effectively as any saboteur.

Know Lightning Protection

Here is a field with which the electrical contractor should be familiar. A reawakening to the importance of lightning protection is taking place today. Contractors should be in a position to know what it is all about and to help solve customers' problems. Detailed information will gladly be furnished by equipment manufacturers. Here is one more phase of electrical construction in which the electrical contractor should become proficient.

***VIRTUOSO** of the keyboard, Frank Block, has his regular stock and trade in an electrical contracting enterprise in Chicago. However, when the boys go social, Frank is drafted to accompany the vocal duets, quartets and sextets.*

More Gossip

Larger Quarters

Carmen J. Longo, president of the Liberty Electric Company, Providence, R. I., announced the removal of his firm from 75 Westminster Street to new, remodeled and larger quarters at 49 Weybosset St., in the same city. Increased business activity made the move to larger quarters necessary.

K. C. Contractors Elect Officers

A. M. Burnett, Crescent Electric Co., was recently elected president of the Greater Kansas City Chapter, National Electrical Contractors Association. Other officers chosen include W. B. Wachter, Wachter Electric Co., vice-president; E. L. Fickie, Fickie Electric Co., treasurer. W. C. Bryant is the secretary and business manager of the group.

Labor Exchange

Electricians in Vancouver, B. C. are still in demand but some firms have been compelled to lay off men due in part to difficulties in obtaining supplies. To help in this situation the Vancouver Electrical Association has requested member contracting firms to notify its office of employees laid off through lack of work or supplies so that other firms needing help can obtain reliable men.

Tires Needed

C. E. Foorman, electrical contractor, was the first person in Milwaukee County to apply for tires under the new federal rationing system. Mr. Foorman, who is engaged in defense housing work, got the inspectors OK to apply for a certificate. From there on the going gets tougher and more complicated, he says.

KEEPS 'EM RUNNING—A. J. Casper, manager, Electro Service, Inc., motor repair specialists of Union City, N. J., has his hands full these days turning out repair jobs for the heavy defense industries in the area.

FATHER AND SON examine an experimental pressed board fluorescent fixture at the Chicago Lighting Institute. E. A. Gould, Jr. (left) has just joined his father's electrical contracting business. Bud, who just returned from the University of Illinois where he studied E.E., finds that business has its homework too.

Mott Moves

The Mott Electric Ltd., New Westminster, B. C., electrical contractors are now occupying larger and more modern premises at 720 Front Street in that city. The firm first operated in that city as the Mott-Watson Electric, some 13 years ago.

Indianapolis League Directors Named

Seven new directors were elected and two returned to the Board of the Electric League of Indianapolis, Inc. at the annual meeting of that organization. Dan C. Hess was re-elected president of the group. Other officers elected include: C. H. Domhoff, vice-president; H. W. Claffey, secretary; C. F. Fitchey, assistant secretary; Ben Olsen, treasurer and W. J. Morgan, assistant treasurer.

The following members were elected to the Board of Directors: C. E. Chatfield, manufacturers division; A. J. Callaway, supply jobbers; Paul Loser, appliance distributors; C. H. Domhoff, dealers; H. W. Claffey, contractors; George W. Ferling, maintenance; Ivan C. Frakes, motor repair; R. H. Wilson, oil heating; and A. C. Crandall, utilities.

The 1942 program, while still of a general nature, is designed to maintain and develop established markets as much as possible under the emergency conditions; to retain and promote public acceptance of the present high standards for the application of electricity; to cooperate in the war effort by coordinating the industry activities through the dissemination of authentic information on priorities, credit regulations and assisting the home and industry in obtaining essential repairs on equipment.

The League program is not on a long-term basis, but will be kept sufficiently flexible, with an ever forward viewpoint, to meet the constantly changing demands of the emergency it was announced.

Thin-Wall or Thick-Wall
— *Threaded or Threadless*

Only with a Kondu fitting can you use *any* kind of conduit at *any* outlet.

Just insert the bushing needed —for either a threadless or threaded connection.

And . . .
lifts out of the line without disturbing conduit

Only with a Kondu fitting can you take out one box and put in another, without disturbing conduit. Every Kondu box is a union in itself.

Other features you'll like: Kondu is almost unbreakable—100% re-usable. Self locking . . . vibration-proof. Easiest and quickest to install.

Have you the Kondu catalog?

KONDU CORPORATION
Erie, Pa.

KONDU

In the News

WISCONSIN CONTRACTORS REVIEW WARTIME PROBLEMS

Wartime problems of the electrical contractor, especially the little fellow, was the central theme of the annual convention of the Wisconsin Electrical Association held at the Hotel Schroeder, Milwaukee, February 13 and 14.

Superstitions were outlawed as more than 220 members and guests gathered on Friday the 13th to attend the heavy sessions. Irving L. Illing, illuminating engineer, Wisconsin Electric Power Co., fired the opening gun by dramatically showing the necessity of electric power to produce our war materials, keep up civilian morale, and for the days following the peace. George Andrae, Milwaukee, Chairman NECA Codes and Standards Committee, reviewed the progress made toward standardization of wires and cables with the resultant savings in critical materials. Outlet boxes and wiring devices will be next, he predicted.

Priorities and defense housing occupied the second session on Friday. A. E. Schanuel, field representative, N.A.W.B., outlined the St. Louis Plan for obtaining the greatest possible electrical adequacy with provision for future outlets, under present priorities limitations for defense housing. Frank J. Tharinger, district manager, Priorities Field Service, W.P.B., Milwaukee, explained the operation of the priorities system with particular attention to the P-100 and M-67 orders. Lack of proper housing decreases defense workers' efficiency, pointed out W. W. Gates, Chief Underwriter, F.H.A., Milwaukee, in explaining the operation of Title 6 for defense home insurance. Carroll F. Sweet, Senior Housing Priorities Examiner, Chicago, asked for more rehabilitation and modernization of existing large houses, pointing out that such work carried the highest priority rating of defense housing.

Apprenticeship standards in the electrical construction industry on a national and state basis were outlined by E. H. Herzberg, Chairman National Joint Apprenticeship Committee, and Edward C. Madsen, Field Representative, Federal Committee on Apprenticeship, Milwaukee. E. J. Fransway, president, Electrical Workers State Conference, Wisconsin, pointed out the responsibility of the employer to tie in with labor on Washington representation and endorsed the necessity of proposed apprenticeship training activity.

At the business session the following officers were re-elected for 1942: president, Robert J. Nickles, Madison; vice-president, E. A. Killoren, Appleton; treasurer, R. J. Conklin, Watertown. E. H. Herzberg, Milwaukee, is the executive secretary. Members elected to the Board of Directors include: Wm. Schlosser, Madison; J. P. Josephson, Kenosha; Henry Trester, Milwaukee, and Charles L. Kehl, Green Bay; Ross E. Williams, Appleton, associate member and utility representative.

Delegates who stayed over enjoyed the hospitality of the Electrical League at its annual dinner dance Saturday evening.

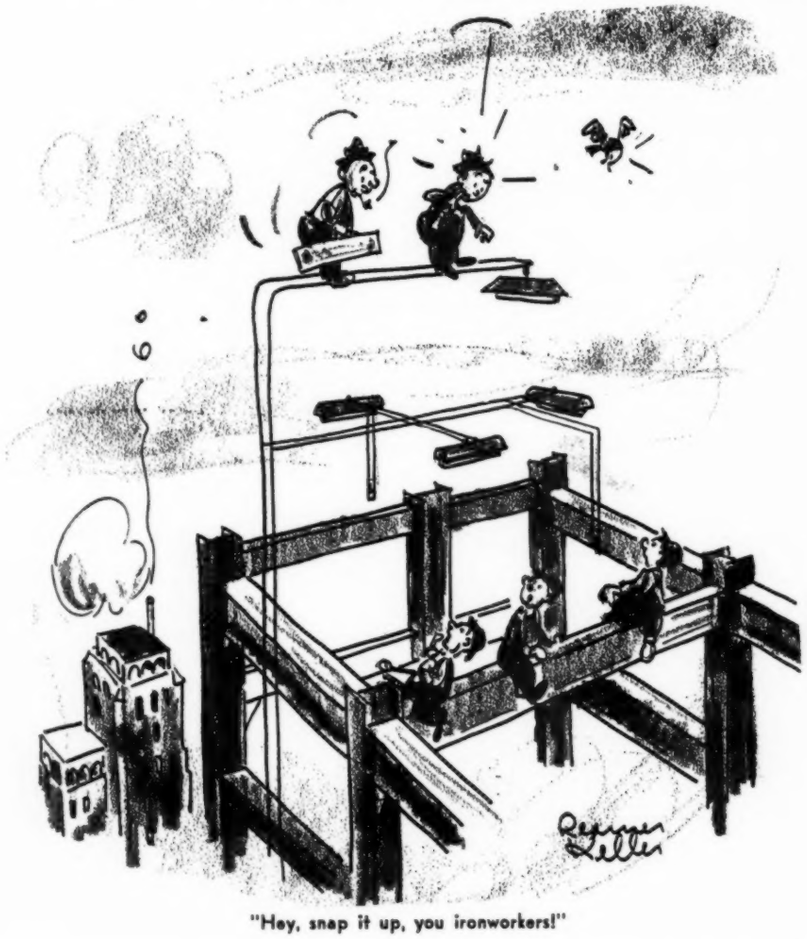
VIRGINIA CONTRACTORS URGE STATE LICENSE

In an effort to obtain favorable action during the current session of the Virginia legislature, the Virginia Electrical Contractors Association is backing a revised and "streamlined" license bill. Senate Bill No. 5, introduced by State Senator Carter Glass, Jr., providing for examination and licensing of electrical contractors has been simplified in scope to eliminate certain features of minor importance to the backers which had aroused objections from other interests in the State.

In its original form, the bill proposed licensing of electrical contractors by function, providing exceptions for industrial plants operating electrical departments and utilities. The "streamlined" revision limits the proposed license to the electrical contracting business thus eliminating "reference by exception" to other industry groups.

ILLINOIS INSPECTORS STUDY DEFENSE

Electrical safety and the inspectors place in the present emergency were the major problems discussed by more than 100 members of the Illinois Chapter IAEI during a two day meeting at the Hotel Sherman,



"Hey, snap it up, you ironworkers!"

A BREAKDOWN

is all right in its place, but not in your place. You can't afford, in these times, to take risks. Avoid interruptions of production and loss of output and money by using

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RENEWABLE FUSES

A dozen or more outstanding features place them far ahead of all other time-lag fuses in economy, safety, and convenience. Ask your dealer about SHUR-LAG fuses today, or write for our Bulletin 400.

THE CHASE-SHAWMUT COMPANY
NEWBURYPORT, MASSACHUSETTS

FUSE MAKERS SINCE 1893

In the News

[FROM PAGE 114]

Chicago, on January 22 and 23.

The inspector's position in the industry and the problems confronting him and the electrical contractor during this emergency were outlined by E. T. Rowland, editor, *Chicago Electrical News* and J. Walter Collins, secretary, Electrical Contractors Association of the City of Chicago, W. K. Evans, Analyst for the Regional Director of Priorities, OPM, Chicago, explained the operation of the priorities system and its effect on the small business man.

Victor H. Tousley, field engineer, NFPA and Curtis R. Wellborn, secretary, Underwriters Laboratories, Chicago, discussed the National Electrical Code in the light of present conditions and the alternates and substitutes approved by Underwriters Laboratories for use during the duration of the war. E. H. Wigdahl, Chicago, president, Cook County Electrical Contractors Association told about the contractors' responsibilities in our war program while E. G. Romeiser, field engineer of Porcelain Mfgs., outlined the place of porcelain and nonmetallic wiring systems under the priorities system.

A question and answer session led by Chairman D. J. Talbot and a board of experts encouraged those present to discuss vital problems and code questions. The type S fuse merited much discussion and unusual interest in blackout control was shown by the inspectors.

New officers elected at the closing business session include: Chairman, T. P. Willerton, chief inspector, Commonwealth Edison Co., Chicago; 1st vice-chairman, J. F. Morton, Galesburg; 2nd vice chairman, C. M. Park, Chicago; 3rd vice-chairman, Norman Laird, Chicago; and secretary-treasurer, W. J. Alcock, Chicago. Members of the executive committee, all of Chicago, are: P. J. Markey, utilities; G. W. Butler, manufacturers; A. J. McGivern, wholesalers; and E. H. Wigdahl electrical contractors.

ELECTRICAL SAFETY for the farm is the all-important job of Fred Mollering (left), Clarion, Iowa and J. E. McDonald of Mattoon, Ill. Both are REA electrical inspectors. Mr. McDonald is also local inspector for Mattoon.

TOUSLEY ON PROTECTIVE LIGHTING COMMITTEE

Victor H. Tousley, electrical field engineer, NFPA has recently been appointed to the A.S.A. Committee on American Defense Emergency Standards for Flood or Protective Lighting of Industrial Plants. In this capacity Mr. Tousley will have a hand in formulating a standard practice for protective illumination of war industries.

MINNESOTA CONTRACTORS STUDY WARTIME FUTURE

"Where Do We Go From Here?" was the problem discussed by some 200 Minnesota Electrical Contractors at sessions of the North Central Convention which drew more than 600 representatives of the electrical industry to the Radisson Hotel, Minneapolis on Feb. 22–25. The convention, in general, followed the pattern of morning sessions for individual groups and all-industry afternoon sessions covering subjects of interest to all electrical men.

The contractor sessions rolled into high gear with the annual meeting of the Minnesota Electrical Association which was largely devoted to an open forum discussion of specific local contractor problems.

At the annual meeting of the Minnesota Electrical Council, A. E. Smiley, electrical contractor from Kansas City, Mo., explained his use of booster transformers for efficient fluorescent lamp operation; also his experiences with direct current fluorescent circuits. Stressing the need for cooperative effort among electrical contractors, August Eckel, Middle West Editor, *Electrical Contracting*, outlined the wartime operations of contractors on defense construction.

At luncheon sessions open to all, Earl Raymond, Priorities Field Service, Minneapolis, reviewed the latest priority regulations affecting the electrical industry. Harold Green, General Electric Co., Lamp Department, stressed the vital importance of light in winning the war.

Convention guests found the answers to many of their queries in the talks given at the all-industry meetings. Topics discussed included utility emergency operations, priority materials distribution, electrical contracting problems under this emergency. Substitute electrical standards, appliance markets, contractors and dealers in defense, blackouts, our responsibility in this emergency, industry accomplishments, adequate wiring in defense homes, flexible distribution systems and electrical inspection problems.

Speakers on the above subjects were L. L. Perry, Interstate Power Co., Dubuque, Iowa; L. G. Mample, General Electric Supply Co., St. Paul; Edwards M. Raetz, past-president, Minnesota Electrical Association, Rochester, Minn.; Glenn Rowell, Fire Underwriters Inspection Bureau, Minneapolis; George H. Johnston, appliance dealer, Minneapolis; J. H. Jewell, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; H. E. Young, president, North Central Electrical Industries; L. E. McDonald, Westinghouse Lamp Division, Chicago; Dr. G. W. Allison, Edison Electric Institute, New York; John King, Editor, *The Electrical Dealer*, Chicago; A. E. Schanuel, National Adequate Wiring Bureau and S. B. Storer, Trumbull Electric Mfg. Co., Chicago.

LOOKS THE SAME as a steel unit, points out E. D. Tillson, Commonwealth Edison Co. Testing Laboratories, as he demonstrates an experimental pressed board fluorescent fixture, designed to bring good lighting into small defense subcontracting plants that can't get priorities for steel units. Sockets and lamps are on a steel wiring channel.

The electrical inspectors session was climaxed with a general question and answer period and a quiz program luncheon at which time $75 in defense stamps were offered as prizes.

At the contractor business sessions the following officers were elected: Minnesota Electrical Association; president, L. E. Schaefer, Pipestone; vice-president, Eric Nylund, Duluth; secretary-treasurer, W. A. Ritt, St. Peter. For the Minnesota Electrical Council, Edward Micka, Hibbing, president; D. F. Kehne, St. Paul, vice president; F. M. Tripp, Minneapolis, treasurer and W. A. Ritt, St. Peter, secretary manager.

ST. LOUIS A.W. PLAN FOR DEFENSE HOMES

When priorities came into the construction picture, adequate wiring in homes, including defense housing suffered a setback. OPM has made definite regulations limiting the number of outlets in defense homes.

The Adequate Wiring Bureau of the St. Louis Electrical Board of Trade began to evolve a plan that would insure the installation of the maximum number of outlets allowed by OPM in defense houses now and to provide for increasing adequacy standards at a future date.

The St. Louis plan has been approved by the Federal Housing Authorities in Washington. It calls for the furnishing of detailed wiring plans and material lists, upon request by the local A.W. Bureau, to any builder desiring to apply to the local F.H.A.

SAFEST HOUSE SERVICE CONNECTIONS

ILLINOIS

PORCELAIN WIREHOLDER INSULATORS

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All corners are rounded to prevent injury to the insulation on the wires. The screws have deep, sharp threads for easy installation. The screws are fastened into the insulators with non-shrinking metal alloy. Will not cause rust streaks on the sides of buildings. These dry process wireholders are made in sufficient styles and sizes to meet all requirements. Wet process porcelain supplied on special order. Large stocks carried. Write for samples and prices.

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ILLINOIS ELECTRIC PORCELAIN COMPANY

Macomb, Illinois

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CAN GET TIME CONTROL BUSINESS Now

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900 SERIES

Of course, the war has changed your business. But you can get profitable time control business NOW.

There are hundreds of manufacturers who can furnish necessary priority ratings and who badly need timers and time switches. For instance, Paragon 900 Series saves time, saves man power and greatly speeds up production on numerous operations such as . . . plastic molding, rubber curing, batch mixing, heat treating, liquid agitation, light exposure, conveyor operation, watchman signals, food cooking, power disconnect, machinery operation, and lighting disconnect.

WRITE FOR THIS BOOK

A complete catalog describing industrial timers, time switches and other time control devices. Valuable for reference. Copies free.

PARAGON ELECTRIC CO., 401 S. Dearborn St., Chicago.

Paragon
BUILDERS OF CONTROL INSTRUMENTS SINCE 1905
Chicago

In the News

[FROM PAGE 116]

office for approval of a project under the defense housing program. These wiring plans are specifically designed:

1. To use the minimum amount of critical materials.
2. To provide soundly engineered wiring installations.
3. To provide the maximum service and convenience within the outlet restrictions of OPM.
4. To include provisions for installing additional outlets, at minimum cost, when materials are available.

The plan also calls for furnishing the following identification and approval media:

1. A gummed label to be placed on the service entrance switch indicating that the wiring is soundly engineered, has maximum number of outlets permissible and has provisions for future outlets. Also, that a copy of wiring plan is on file at the office of the Adequate Wiring Bureau of St. Louis Electrical Board of Trade for future reference.
2. A card to be placed in each house constructed under the program, showing F.H.A. cooperation in designing an engineered wiring plan for the house, with provision for additional outlets to be installed in the future.
3. A memorandum to builders or financing agencies making application for approval. This states that F.H.A. financed defense houses will carry the A. W. sticker and card and that privately financed defense homes may secure such stickers and cards providing previous arrangements have been made with the St. Louis F.H.A. office.
4. An agreement form, optional with builders of projects not carrying F.H.A. loans. Under this, the applicant agrees to guarantee that the wiring installations in the defense houses he builds will be made in accordance with the A.W. plan accompanying his application, including the provisions for future outlets indicated on the plan. F. H. A. then agrees to furnish the applicant with the necessary stickers and cards.

The homes wired under this plan will definitely have electrical inspection. However, as yet, it has not been determined just who the inspection authority will be. To simplify the problem of control, the service offered by the St. Louis Adequate Wiring Bureau will be limited to eastern Missouri, the area within the jurisdiction of the St. Louis office of F. H. A.

WARTIME LIGHTING INSTITUTE TOPIC

The Chicago Lighting Institute devoted an entire day on February 6 to a clinic on wartime lighting, built around the theme "Light Will Keep Them Rolling". More than 200 representatives of the electrical utility, lighting manufacturers, wholesalers and contracting industries were treated to a round robin of lecture demonstrations covering every phase of lighting from high

MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

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Sizes from .250" O.D. Tubing to 1 1/4" conduit.

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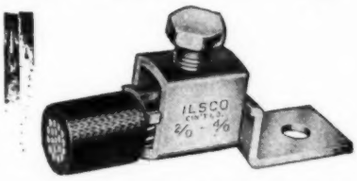
25 N. Peoria St., CHICAGO

ILSCO
SOLDERLESS CONNECTORS

HAVE YOU TRIED
The New Ilsco Lugs?



BUILT FOR OVERLOADS!

The new design—as passed by the Underwriters' Laboratories May 1, 1940.

GENTLEMEN
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5629 MADISON ROAD — CIN., O.

intensity production illumination down to total blackout.

A. R. Hogue, president of the Chicago Lighting Institute opened the clinic and was followed by Ward Harrison, director of General Electric's Nela Park Engineering Department, who discussed lighting for production. L. E. McDonald, Westinghouse Lamp Division and C. R. Stover, General Electric Lamp Department shared honors in covering the operating characteristics and uses of various light sources for defense industries.

James Gaynor, Commonwealth Edison Co., and Glenn G. Boyd, Public Service Co. of Northern Illinois told how to maintain lighting facilities during war time. Maurice Ross and John Harrington, Commonwealth Edison Co., and O. W. Bard and C. N. Carlson, Public Service Co. of Northern Illinois took the boys through the paces when they had them work out several actual illumination design problems in the Institute Classroom. L. V. James, G. E. Lamp Dept. and D. N. Ingwersen of the Chicago Lighting Institute discussed the importance of power factor in evaluating lighting.

E. D. Tillson and Roy Graves of the Commonwealth Edison Co. Testing Laboratories struck a somber note when they revealed the deplorable lack of adequate lighting in the plants of hundreds of defense subcontractors. They introduced two experimental "wartime fluorescent fixtures" with reflectors of pressed board, similar to that used as slot insulation in motors. With an interior finish of white enamel, these units have an efficiency of 77 percent, are light in weight, inexpensive and reduce to a minimum the amount of metal needed. They are designed specifically for temporary use in subcontracting plants where good lighting is sorely needed in a hurry and where priorities standings on metal fixtures are far down the list.

The theory of protective floodlighting of plants, yards, fence lines and glare lighting was outlined by D. N. Ingwersen and R. C. Winterbottom of the Institute. Several typical plant layouts were discussed.

The clinic adjourned with a final assembly period where Carl Zersen, manager of the Chicago Lighting Institute, discussed the progress and developments that have been made in blackout lighting. Among other things he enumerated the various lamps and reflectors developed, the material on the market for industrial, commercial and residential blackouts and discussed the general theory of blackout lighting in each case.

CLAFFEY HEADS INDIANAPOLIS CONTRACTORS

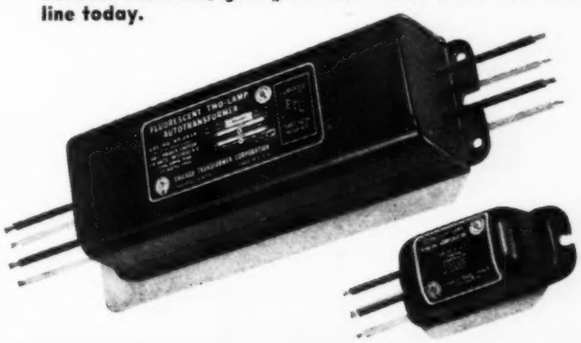
At a recent meeting of the Electric League of Indianapolis, Inc., Harry W. Claffey, vice-president of the Sanborn Electric Company, was elected Director to the Board representing the Contractors Division with a roster of 39 members. He also will act as chairman of this division for the ensuing year. Charles Coonce of Charles Coonce Electric Service is the new vice-chairman. Members of the Division Advis-

Where LIGHT must be right!

SPECIFY FLUORESCENT LAMP BALLASTS BY CHICAGO TRANSFORMER

Never before has the right light been so important for a right job.

With American industry geared to a staggering production pace, there's no time for lighting failures to disrupt schedules—for faulty lighting to endanger accuracy and safety. That's why Ballasts by Chicago Transformer are used in more industrial Fluorescent Installations every month. For Chicago Transformer Ballasts mean dependability where light counts most—Dependability assured by laboratory tests for heat tolerances, Watt delivery control, hum requirements, and wave shape tolerances and long lamp life. Write for new bulletin FBB-0430, giving full details on the entire Chicago line today.



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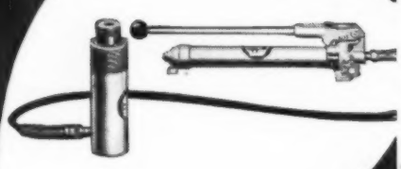
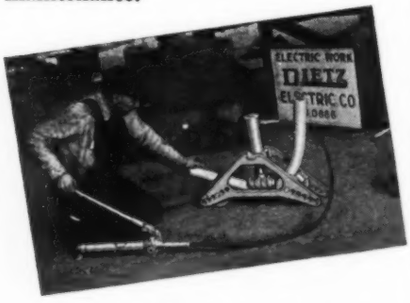
3505 WEST ADDISON STREET • CHICAGO

The HEART of a PIPE BENDER



is its POWER UNIT!

Pipe Benders have generally depended on hydraulic power from self-contained, "one-purpose" jacks that work only in limited positions. Blackhawk Benders are different — they have *Porto-Power Hydraulic Units*—hence, operation at any angle, light weight and extra utility. These same Porto-Power Units are widely used in many fields and are the only perfected equipment of their kind! Blackhawk is a specialist in building hydraulic equipment — and Porto-Powers are famous for their dependability, performance and freedom from maintenance.



Blackhawk Pipe Benders bend rigid conduit and pipe up to 4" diameter smoothly and without kinking. Save need for elbows, couplings, cutting and threading. Portable — lightweight — can be carried or rolled to the job and operated by one man to speed up construction and changeovers.

MAIL COUPON TODAY

BLACKHAWK MFG. COMPANY
Dept. P2032, Milwaukee, Wis.

Send Full Information on your Pipe Benders.

Name.....

Company.....

Address.....

In the News

[FROM PAGE 119]

ory Committee are: George Courtney, Courtney Electric Shop; James Overbey, Overbey Electric; and Mr. Claffey.

The program for this year includes bimonthly meetings, an intensive study of adequate wiring in defense homes and an effort to foster the adoption of a new City Electrical Code. Indianapolis is now operating under the obsolete 1933 National Electrical Code, with only minor revisions for current interpretations and applications.

WIGDAHL HEADS CHICAGO GROUP

The Cook County Electrical Contractors Association, Chicago, recently celebrated its fourth anniversary with a birthday dinner meeting at which the new 1942 officers were installed.

E. W. Wigdahl, Wigdahl Electric Co., heads the governing body as president. G. W. Reinke, G. W. Reinke Electric Co., is the new vice-president. A. L. Simmons, Clark Electric Co., serves another term as secretary and Henry Bell, Commodore Electric Co., continues as treasurer. In addition to installing the above officers, E. T. Rowland, Editor, *Chicago Electrical News*, as installing officer inducted the following new members of the Board of Directors: P. J. Falson, R. G. Parker, T. L. Hankins, and E. J. Lynch. Re-elected members on the board are Emil DeHaan, Albert Leavitt, and E. L. Reeve. Herbert Binner continues as executive secretary of the group.

Timely messages from cooperating electrical industry groups were presented by A. J. McGivern, managing director, Chicago Electrical Wholesalers Association; D. J. Talbot, acting chief electrical inspector of Chicago; J. F. Ferrari, president, Electric Motor and Service Association, Central District Chapter, NISA, and R. G. Raymond, assistant manager, lighting sales, Commonwealth Edison Company.

President Wigdahl, in accepting the reins from outgoing president E. A. Gould, pledged association cooperation in the war program and pictured "joint venture" enterprises among electrical contractors as the immediate means of speeding up electrical construction.

VACANT BUILDING DATA ASSEMBLED

An industrial building utilization section of the Plant Site Board has been announced by Douglas C. MacKeachie, Director of the Division of Purchases. Frederick A. Kimmich, industrial engineer from Detroit, has been placed in charge.

The industrial building utilization section will collect all information on available

EVERY PHASE of electrical maintenance and repair work covered in this library

5 volumes of practical how-to-do-it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

Electrical Maintenance and Repair Library

2042 pages, 1721 illustrations and diagrams

These books show you how to

—install all types of motor and generator units;
—locate breaks in armature windings and do a workmanlike job of rewinding;
—know just what is wrong with an electrical machine and take charge of installation and maintenance work;
—make accurate tests of switchboards and apparatus and correctly balance the power with the load;
—handle every sort of wiring job;
—show competence whether it be in the use of a Stillson wrench or a Wheatstone bridge.

New trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a new book full of helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

10 days' examination
Easy monthly payments

We want you to examine this Library for 10 days. If you don't want them at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

EXAMINATION COUPON

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Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you $1.00 in 10 days, and $2.00 a month until $15.00 has been paid. Otherwise I will return the books postpaid.

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Position .....EC. 3-42

vacant industrial buildings and make this information available to the Procurement Divisions of the Army and Navy. Government agencies may then cooperate with the Plant Site Board in placing contracts for the manufacture of war materials in such a way that these buildings will be utilized.

Owners of usable vacant factory buildings have been asked to mail to the Plant Site Board, Social Security Building, Washington, D. C., information as to land area, floor area and particulars regarding their plants.

SHARP REQUESTS CONSERVATION DATA

Factual information, brief or authentic data in condensed form on conservation of strategic materials, tools, dies and production facilities, stocks and availability of materials, safety to life and property, ultimate effect upon peace time standards and installation rules for new wiring methods from recognized industry organization or other interested groups, has been requested by L. Alan Sharp, Chairman, Working Committee Interior Wiring Methods, Room 3316, N. Interior Building, Washington, D. C. Mr. Sharp is electrical engineer for the U. S. Housing Authority.

The committee is charged with formulating war emergency policy concerning wiring methods, particularly for cantonments and housing projects, to be recommended to or adopted by the various federal agencies.

OFFICERS OF WISCONSIN CHAPTER, N.I.S.A.

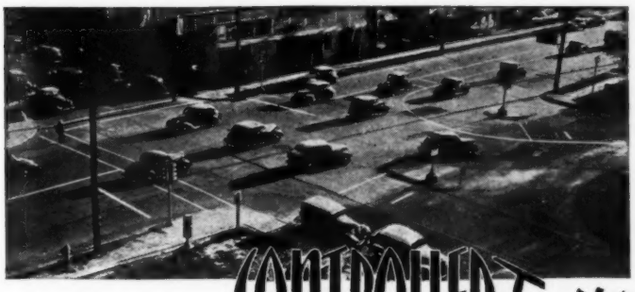
The Wisconsin Chapter, N.I.S.A. has chosen the following officers to guide the activities of the organization during 1942: president, Carlos L. Harry, Holt Electric Motor Co.; first vice-president, William J. Bentley, Bentley Electric Co.; second vice-president, William R. Sorgel, Sorgel Electric Co.; and secretary-treasurer, Roy Schulz, Al Schulz & Son Electric Company.

The Executive Board of the Chapter is Composed of the above officers and the immediate past president Al Tellier.

CHARLOTTESVILLE ORDERS BLACKOUT SWITCHING

A city ordinance requiring means of operating store window lights from outside was adopted in Charlottesville, Va., on Feb. 1. The ordinance is intended to permit police and air raid wardens to quickly extinguish window lights and signs during blackout warnings.

On smaller installations the control is provided by a simple extension of the circuit to a switch at the front door marked conspicuously for blackout operation. On heavier window loads the switch operates in a contactor circuit so that the lights can be extinguished but not restored.



CONTROLLED Traffic
"SPEED with SAFETY"

This unusual traffic intersection was a knotty problem for the traffic engineer who had to control it with traffic signals. Simplex-ANHYDREX Underground Cables were specified and used because it would be difficult and expensive to get at the cables after installation and there had to be a minimum of traffic interruptions. With ANHYDREX the possibilities of corrosion, electrolysis, sheath currents and other troubles that frequently interfere with operation of metallic sheath cables could be ignored. Some of the cables are in conduits and others laid directly in the earth.

If you would like more information about Simplex-ANHYDREX Underground Cables we shall be pleased to send a descriptive booklet upon request.

SIMPLEX WIRE & CABLE COMPANY
79 Sidney Street, Cambridge, Massachusetts

SPEED UP PRODUCTION!

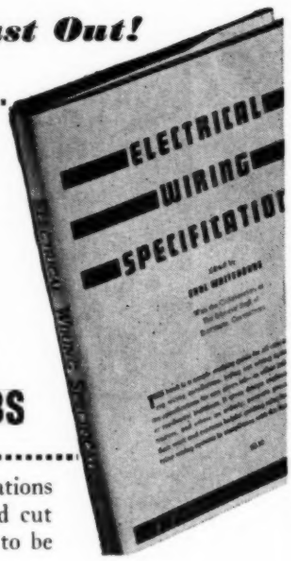
. . . with this efficient and high quality Industrial unit. Continuous or individual installation . . . for 40 and 100 watt Mazda F Lamps.

"V" shaped reflector for maximum light output—finished in *"Klasium"*, Lighting Product's specially compounded baked enamel that is bonded to the metal and gives more light per watt. *"One Man Installation"* features enable exposing wiring channels without taking the fixture down.

Write for Bulletin 270 and *Klasium* folder with actual sample.

LIGHTING PRODUCTS, INC.
HIGHLAND PARK ILLINOIS, U. S. A.

Just Out!



Simplifies, speeds up, and improves the PLANNING AND SPECIFYING OF ELECTRICAL WIRING JOBS

Now you can make sure that plans and specifications tell all and tell it clearly—to help sell the job, and cut down losses from misunderstandings about what's to be done and how it's to be done. This new book gives a simple guiding system—tells in the most concise, direct manner what steps to follow, what data to use—a valuable tool for designers, estimators and contractors.

ELECTRICAL WIRING SPECIFICATIONS

By EARL WHITEHORNE
and the Editorial Staff of
Electrical Contracting

181 pages, 6 x 9
48 illustrations, $2.50

- **Do you want to know just what sort of proposal is most effective for a small job?**
- **Do you want to make sure you get in everything that should go in a big job?**
- **Do you want to be sure of considering all pertinent rules and standards that affect a particular job?**
- **Do you want to know how to put installation parts, materials, costs, etc., in the form that eliminates misunderstandings?**

This book gives you a step-by-step procedure for drawing up wiring plans and specifications that will do a better selling job and aid efficient construction. Covers wiring for light, power and signaling—in industrial, commercial, farm, and residential buildings—outlining a simple way of developing specifications, and giving guiding rules of the National Electrical Code, standards, engineering data, and diagrams to simplify your work.

These chapters make planning and specifying an orderly, easier, surer procedure

1. Taking the Gamble out of Wiring

Part I. WIRING FOR RESIDENCES, APARTMENT HOUSES, AND FARMS

2. Residential Wiring
3. Apartment-house Wiring
4. Wiring Farm Buildings

Part II. WIRING COMMERCIAL INSTITUTIONAL, AND FACTORY BUILDINGS

5. Rules for Planning
6. What to Do for Lighting
7. What to Do for Power
8. Provision for Heating Load
9. Signaling and Communication
10. How to Specify the Large Job
11. Submitting the Proposal

Appendix. Code Tables

10 DAYS' FREE EXAMINATION

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Send me Whitehorne's Electrical Wiring Specifications for 10 days' examination on approval. In 10 days I will send $2.50 plus few cents postage, or return book postpaid. (We pay postage on orders accompanied by remittance.)

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Company .....EC. 3-42

In the News

[FROM PAGE 121]

MILWAUKEE HOLDS LIGHTING CONFERENCE

Representatives of Milwaukee's various electrical groups attended a mid-winter lighting conference at the Public Service Auditorium, Jan. 28, to review the latest developments in the lighting art.

A demonstration of the newly remodeled auditorium by Irving Illing, illustrated the blending of modern lighting and architectural features to enhance appearance and increase general utility. Charles Laupp, commercial and industrial lighting supervisor of the Wisconsin Electric & Power Co. outlined the changes in industrial illumination and the upward trend of lighting standards.

One of the bright spots of the meeting was the discussion of fluorescent lighting maintenance when Charles Stover, G.E. Co. revealed the mysteries of fluorescent trouble shooting. This was followed by a question period during which time the bevy of experts knotted their brows and poured forth the answers.

COMING MEETINGS

National Industrial Service Association—Annual Convention, Cincinnati, Ohio, May 4–6.

National Electrical Contractors Association—Annual Convention, Bigwin Inn, Lake of Bays, Ontario, Aug. 31–Sept. 5.

Priorities

NEW FORMS ISSUED

Applications for individual preference ratings may now be filed on the new PD-1A application blanks in accordance with Priorities Regulation No. 3. Preference ratings assigned on Army and Navy contracts may now be issued on Form PD-3A.

The most important feature of Priorities Regulation No. 3 is that ratings assigned on PD-1A and PD-3A forms may be extended to suppliers and sub-suppliers by a simple endorsement on purchase orders. Heretofore, ratings assigned in response to applications on the old PD-1 forms have not been extendable under any circumstances, and ratings assigned to Army and Navy orders on PD-3 forms could be extended only if the extension were countersigned by an authorized government officer when the amount involved was more than $500.

When an individually rated order is served upon a supplier by the original applicant under the new procedure, the rating may be extended by the supplier, by his

suppliers and sub-suppliers to obtain any material which will be delivered to the original applicant in accordance with the rating, but neither the applicant, his suppliers or sub-suppliers may use the rating to obtain machinery or capital equipment which they use in fabricating parts to fill the order. If producers who have been assigned a rating on a PD-1A form need machinery or capital equipment for this purpose which they cannot obtain without priority assistance, they must apply for a separate preference rating on another PD-1A form. Prime contractors who need machinery or equipment to be used exclusively in filling Army or Navy orders may be given a rating for use in obtaining such machinery or equipment on PD-3A forms.

Another important change made by Priorities Regulation No. 3 allows the recipient of an individual rating, his suppliers and sub-suppliers to employ the rating for replacement in inventory of materials used in filling the rated order, provided such replacement does not increase inventories above a practicable working minimum.

If the materials to be replaced are processed, assembled or otherwise physically changed by the supplier, the rating must be extended while the materials are in process of fabrication. For materials which are not processed or otherwise changed by the supplier, extension of the rating may be deferred up to three months, until an order can be placed for the minimum quantity procurable on customary terms. This provision is primarily for the benefit of wholesalers and distributors, enabling them to group their own orders while making deliveries in small quantities.

The new regulation also allows a supplier or sub-supplier who has received two or more purchase orders bearing ratings of the same grade to include in a single purchase order or "basket," within the limitations which have been indicated above, any or all of the material which he requires to make deliveries in accordance with the rated purchase orders which have been served upon him. In such case, he must specify in the certification on his own purchase order all of the Preference Rating Certificate form numbers and serial numbers referring to the orders in connection with which he is extending the ratings.

MOTOR SHOPS ELIGIBLE FOR P.R.P.

Motor rewinding shops, and other shops performing industrial repairs are eligible for priority assistance under the Production Requirements Plan, or the Modified Production Requirements Plan for small business establishments.

The new plan known as the Modified Production Requirements Plan is designed to enable the shop engaged in war or essential civilian production to obtain priority assistance to meet his needs for scarce materials over a calendar quarter.

Application blanks in a new form, PD-25-X, may be obtained from the small business section of the Production Requirements branch, War Production Board, in Washington, or from the branch offices of

WHERE DUTY
as well as BEAUTY
IS MORE THAN *SKIN-DEEP*

TO "KEEP 'EM FLYING" WE KEEP ON SUPPLYING

Because of what we *put into* Superior Brushes we know what you can expect to *get out* of them. In a motor brush "duty, as well as beauty, is more than skin-deep."

It is those priceless, invisible ingredients, the heritage of decades of experience, that extra finesse of workmanship, and the exclusively designed machinery all of which makes Superior Brushes truly *superior!* They not only look the part but perform the part that is today's watchword in industry . . . *dependable duty.*

Our production is keyed to take care of non-defense as well as defense industries—THE VICTORY PROGRAM!

SUPERIOR
CARBON PRODUCTS INC.
9115 George Ave. Cleveland, Ohio

Balanced Qualifications SCP .....*All That the Name Implies*

Says the Wizard of O-Z

● Avoid accidental grounds by installing O Z Insulated Bushings at every cable entrance. These husky bushings are made of tough malleable iron (cadmium plated or hot-dipped galvanized) as well as Bronze, Aluminum and in special alloys. All sizes from ½ inch to 6 inch conduit . . . completely listed in O Z Catalog No. 4. Have you a copy?

The Bakelite insulator rim is molded and locked into the casting, making a solid, one piece bushing

THE O-Z WAY IS THE *Easy* WAY

O.Z. ELECTRICAL MFG. CO.
262 BOND STREET · BROOKLYN, N. Y.
REPRESENTATIVES IN PRINCIPAL CITIES
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ALL THIS →

and 255 MORE "Br efalogs" packed between two covers!

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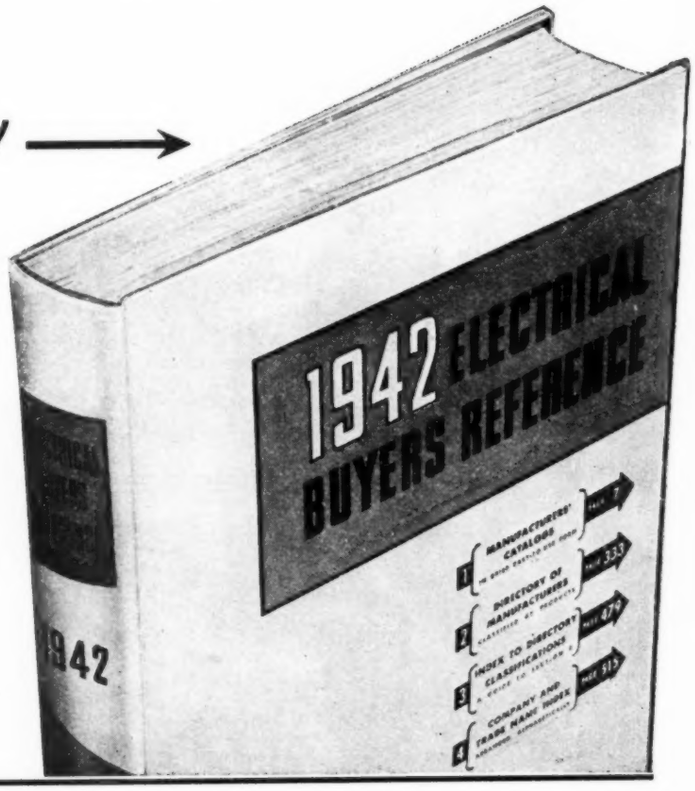

Reproduced are just the first pages of a few of the Briefalogs in the 1942 Electrical Buyers Reference—covering a variety of electrical and allied products. Here you will find the latest information in brief easy-to-use form — plus names, addresses, and trade names of over 3500 manufacturers, classified for quick reference.

In short, a gold mine of data at your fingertips! Turn to this 1942 Electrical Buyers Reference *first*—it's the quickest, easiest way to get the answer to many of your buying problems.

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1949
WARD LEONARD
RING TYPE RHEOSTATS
PLATE TYPE
DIRECTIVE DATA ON
Westinghouse
PINCO INSULATORS AND FITTINGS
Right on the Job
PINCO INSULATORS
RIGID INSPECTION STANDARDS
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INSULATED WIRE WORKS DIVISION
ROEBLING
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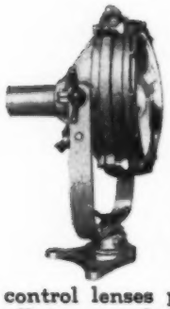
GENERAL ELECTRIC
Wiring MATERIALS
U-Stape
U. S. SPLICING COMPOUND
U. S. SECURITY RUBBER TAPE
U. S. HOLDTITE SPLICING COMPOUND
USCO SPLICING COMPOUND
U. S. TWINSULATION TAPE
UNITED STATES RUBBER COMPANY
Electrical
FRANK ADAM ELECTRIC CO.
DUCT
Feeder and Plugin Types
H. B. SHERMAN MFG. CO.
BATTLE CREEK MICHIGAN
A Complete Source of Supply for
Terminal and Wire Connectors
BENJAMIN ELECTRIC MFG. COMPANY
Manufacturers of Industrial Lighting and Floodlighting Equipment
DES PLAINES, ILLINOIS
BENJAMIN

FLOOD-LIGHT PROJECTORS

for heavy duty service



Pyle-National floodlight equipment is built to stand up under severe service conditions—delivering the reliability essential to both protective lighting and work lighting around industrial plants. Advanced design with light control lenses provides high optical efficiency and correct light distribution. Substantial weatherproof construction with sealed interior protects reflector and lamp bulbs and reduces maintenance to the minimum.

The complete line includes many standard types, including portable projectors, in a range of sizes from 100 watts to 5000 watts. Catalog No. 2100 gives complete specifications, with beam efficiency, candlepower, and light distribution data.

Pyle-National electrical equipment includes a full range of types of Pylets—the improved conduit fittings, to cover all requirements of industrial plant wiring. Write for Pylet Catalog 1100 showing Rectangular Pylets, FS and FD Series Pylets, Vaportight Fixtures, Fixture Hangers, Switch, Fuse and Circuit Breaker Pylets, Junction Pylets, Explosion-proof and Dust-tight types for hazardous locations, Plugs and Receptacles and other equipment.

The Pyle-National Company
1344 North Kostner Avenue
Chicago, Illinois

In the News

[FROM PAGE 123]

the War Production Board in principal cities throughout the country.

Each applicant under the plan must fill out five copies of Form PD-25-X. He will retain one copy and send the other four to the Production Requirements Branch, War Production Board, Washington, D. C. If the priority assistance is granted, a certified copy will be returned to him, specifying the kinds and quantities of materials for the purchase of which he may use the priority rating or ratings assigned to him. Applications for additional priority assistance may be filed during any quarter if the pattern or orders filled by the applicant or his volume of business changes substantially during the quarter.

When priority ratings are assigned on Form PD-25-X, they may be used to obtain the authorized quantities of materials simply by writing a prescribed endorsement on purchase orders signed by a designated official of the applicant company. The rating may be extended by suppliers and subsuppliers of the original applicant to obtain delivery of materials which are to be physically incorporated in the applicant's products. However, manufacturers who operate under this plan may not use any preference ratings other than those authorized on Form PD-25-X, without specific permission from the Director of Priorities, except when they use the A-10 rating assigned by Preference Rating Order P-100 to obtain repair, maintenance, and operating supplies.

The manufacturers who operate under the Modified Production Requirements Plan are subject to the general provisions of Priorities Regulations No. 1.

SUPPLEMENTARY PRIORITY ORDERS

The following priority orders and changes from Nov. 30, 1941 to Jan. 15, 1942 are selected from the list published as of Feb. 3, 1942. This abbreviated list covers the order numbers and changes of direct or marginal interest to electrical construction, repair and maintenance.

"P" Orders

P-6-a (Amendment January 3, 1942), Defense Supplies Rating Order, March 31, 1942.

P-19-g, Defense housing projects, July 31, 1942.

P-40, (Amended December 30, 1941, Extended January 10, 1942), Industrial lift trucks, March 10, 1942.

P-55, (Amended January 12, 1942), Defense housing projects, until revoked.

P-56-a, Mining machinery and equipment, until revoked.

P-71, Completion of certain private housing projects, March 31, 1942.

P-73, Smelters (Copper, Lead, Zinc, Antimony, Mercury, and Cobalt) Maintenance, repair, and supplies, until revoked.

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(Classified Advertising)
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15 Cents a Word, Minimum $3.00. POSITIONS WANTED (full or part time salaried employment only), ½ above rates, in advance.
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REPRESENTATIVES WANTED for established

PANEL AND SWITCH LINE

We Can Deliver the Goods

Here's an opportunity for good men! Represent a well-known concern manufacturing an established line of Safety Switches, Service Equipment, Panelboards, and allied equipment.

Our products have established a high standard of quality in their field. . . .

An opportunity for men with proven ability to produce.

RW-31, Electrical Contracting
330 West 42nd St., New York City

Your Pacific Coast Branch

If you are considering closing your Pacific Coast Branch on account of present conditions, a sales organization, with warehouses, would like to hear from you, as they may be in a position to be of service.

RA 28 Electrical Contracting
68 Post St., San Francisco California

WANTED
Portable DC **VOLTMETER AND AMMETER.**
Armature coil **WINDINGS AND SPREADING EQUIPMENT.**
TAPING MACHINE.
1, 2, 3 and 5 h.p. D.C. **MOTORS,** 110-125 v.
KATO ENGINEERING COMPANY
Mankato, Minnesota
Manufacturers of AC generators 350 to15,000 watts, 2, 3 and 4 wire. Also DC generators.

WE BUY AND SELL
MOTORS
TRANSFORMERS
MOTOR GEN. SETS
OIL SWITCHES
AIR CIRCUIT BREAKERS
ELECTRIC EQUIPMENT CO.
347 N. Clinton Ave., Rochester, N.Y. Tel: Main 252

NO PRIORITIES on porcelain wiring devices. R. G. Romeiser, field engineer Porcelain Manufacturers, tells Burton Stapp of Chicago. That's the reason for the happy smiles.

P-83, Petroleum industry, until revoked.
P-90, Production requirements plan, varies.
P-91, Elevators, escalators, and dumbwaiters, until revoked.
P-98, Petroleum industry, assistance extended to all branches not covered by previous orders, February 28, 1942.
P-100, Maintenance, repairs and operating supplies, indefinite.

P. R. P. EXTENSION

Companies operating under the Production Requirements Plan are permitted to extend AA ratings without special permission from the Bureau of Priorities through an amendment to Preference Rating Order P-90 issued by the Division of Industry Operations.

Producers operating under the Production Requirements Plan have been forbidden to make use of any preference ratings except those assigned on PD-25A application forms. The amendment makes an exception to this rule in the case of AA ratings, to avoid delay in the handling of rush military contracts.

NO PRIORITIES FOR RAID SHELTERS

Priority assistance will not be granted for the construction of air raid shelters in the United States, J. S. Knowlson, Director of the Division of Industry Operations, WPB announced following a conference between officials of WPB and the Office of Civilian Defense.

The decision was reached following a careful analysis of the materials which would be required for shelters and the quantities of such materials available.

The amount of critical material necessary to build enough shelters to protect citizens inhabiting all the coastal areas of the United States would run into fabulous amounts, it was claimed.

WHERE TO BUY

Equipment, Materials and Supplies for Electrical Construction—Maintenance—Repairs

DRILLS CONCRETE—METAL—WOOD

WODACK "DO-ALL" ELECTRIC HAMMER AND DRILL

Saves time and money installing expansion anchors. Drills concrete to 1⅜" dia.; metal to ⅜". Two tools in one. Easy to maintain. Universal motor. Write for folder.

Wodack Electric Tool Corporation
4628 W. Huron St. Chicago, Ill.
Telephone AUstin 9866

TEST-O-LITE

Tests Everything Electrical From 100 to 550 Volts

Indispensable to electricians. Equipped with Neon light which tells instantly where trouble lies in electric circuits, fuses, cut-outs, motors, radios, electric appliances; indicates hot or grounded wires; tells A.C. from D.C.

Only TEST-O-LITE, original Neon tester, has exclusive patented safety features. Far superior to clumsy test bulb. Fountain pen size with pocket clip. Useful in homes also.

List $1.50 at leading jobbers.

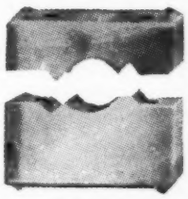
L. S. BRACH MANUFACTURING CORPORATION
57 Dickerson St., Newark, N. J.

ALLEN SODERING SALTS

Soders all metals but aluminum. Non acid. Convenient powder form. Just add water. Send for samples.

L. B. ALLEN CO., INC.
6715 Bryn Mawr Ave. Chicago, Ill.

SAFETY — ECONOMY



Specify:

"SUPERIOR" B&D CLEATS

for

INDUSTRIAL WIRING

Write for Information and Prices

SUPERIOR PORCELAIN CO.
Box 669 PARKERSBURG, W. VA.

No Time Lag!

Transfer from normal to emergency service is *really instantaneous* with

ZENITH IMPROVED AUTOMATIC TRANSFER SWITCH

All contacts on one shaft, operate in same direction. *Electrically held.* No "off position" possible. A.C. to A.C., A.C. to D. C., any combination. 1, 2, 3, 4-pole types, 18 capacities, 30 to 400 amps. Send for Zenith Catalog.

ZENITH ELECTRIC CO.
845 S. Wabash Chicago, Ill.

A WARTIME NECESSITY

"Jiffy" HOLE CUTTER

will cut holes in steel, ¾" to 6" in diameter, quickly and easily. Just the thing for emergency repairs.

"Jiffy" PIPE BENDER VISE

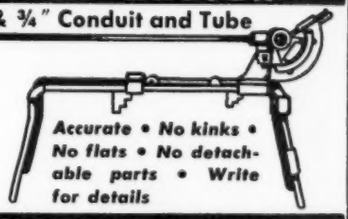
bends ½", ¾" and 1" conduit in a jiffy. No kinks.

Write for folder!

CLYDE W. LINT
The Jiffy Line
100 SO. JEFFERSON ST. CHICAGO

BLYTHE BENDERS BEND BETTER—

½ & ¾" Conduit and Tube



Accurate • No kinks • No flats • No detachable parts • Write for details

HARRY BLYTHE
1550 LAFAYETTE, DENVER, COLO.

PULL FUSES QUICK AS A WINK!

Handiest tool in kit. Pulls all fuses ¼" to 13/16" dia. Hard horn fibre, 3½" long. Big help with vice-like Beryllium copper clips or crowded panels. 15¢ post paid anywhere in U.S.A.

LITTELFUSE INC. 4789 Ravenswood Ave. CHICAGO, ILLINOIS

JERKIT FUSE PULLER

If this or other advertising does not supply the information concerning products or services wanted, please write:

ELECTRICAL CONTRACTING
New York City.

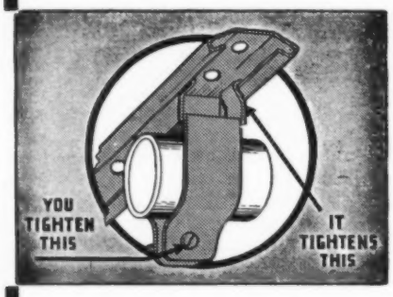
Electric Operators For Any Overhead Type Door

DOORS AND OPERATORS INC.

See page 295 Elec. Buyrs. Ref. TIFFIN, OHIO

With Only One Screw to Tighten . . .

THE CLEVELAND CONDUIT HANGER



Gives You a Quicker Easier Installation

"CONVINCE YOURSELF"

"Send for Circular Giving Full Details"

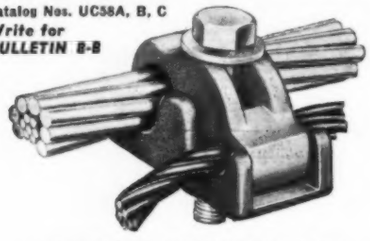
THE CLEVELAND SWITCHBOARD CO.

2927 E. 79 St. Cleveland, Ohio

K&H Solderless Terminal LUGS — A SIZE and TYPE for every need! — K&H Solderless CONNECTORS

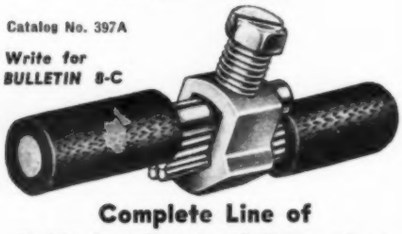
POLE LINE CONNECTOR

Catalog Nos. UC58A, B, C
Write for BULLETIN B-B



SERVICE ENTRANCE CONNECTOR

Catalog No. 397A
Write for BULLETIN B-C



Complete Line of Solderless Lugs and Connectors

WRITE FOR CATALOG NO. 3LC

KRUEGER & HUDEPOHL

232-8 VINE ST. · · · CINCINNATI, OHIO

In the News

[FROM PAGE 127]

A-10 OR HIGHER FOR COPPER PRODUCTS

Copper and copper products cannot be sold by mills, warehouses or foundries except on preference ratings of A-10 or higher according to an amendment issued on February 6 by the Division of Industry Operation, W.P.B. to order M-9-a. The Order previous placed a similar restriction on refiners of copper but did not include dealers in finished products.

PRIORITY FORMS MAY BE REPRODUCED

All priority forms and orders, with a few exceptions, may now be reproduced, according to the terms of Priorities Regulation No. 5, issued February 5 by the Division of Industry Operations.

The Regulation applies to all documents heretofore issued, and to those issued hereafter, except in cases where reproduction may be specifically prohibited.

Copies of any order which contains the name and address of the producer or other person to whom the order is issued or a serial number identification, may not be reproduced without the name and address and serial number.

Reproduction for use of the new application form, PD-1A, is permitted if copies are identical with the officially published version as to wording, paragraphing, punctuation and size, and substantially the same as to color and paper.

The new Form PD-3A may not be reproduced for use, but copies clearly marked "Specimen Copy" may be made for purposes of information.

Reproduction of forms PD-1-c; PD-3; PD-3A; P-25-a through P-25-e; P-26-a through P-26-e and P-35 are prohibited unless expressly permitted by the Director of Industry Operations.

CHEMICAL PLANTS GIVEN HIGH RATING

Repairs and maintenance of war chemical plants have been assigned high priority ratings for necessary materials.

Preference rating order P-89 assigns an A-1-a rating to deliveries of materials to repair actual breakdowns; A-1-c to materials required to avert immediately threatened stoppages, and A-3 to the procurement of materials for other repairs, maintenance and operation.

Before applying any of the ratings assigned by the order, a manufacturer must be assigned a serial number under the order. Serial numbers are assigned only to com-

★

Where the editors leave off— the advertisers carry on

We don't mind admitting that time was when the editors of a publication went one way . . . and the advertisers another.

Then came the period when editors by their helpfulness on the *"how"* of doing things better and faster and easier and at lower cost . . . pointed the way for advertisers to talk about the specific *"what"* to use to accomplish these things.

So where the editors stop, the advertisers now carry on.

That's the kind of a job most advertisers are trying to do today. Naturally, many of them are restricted by war pressure as to *"what"* they can offer in the way of materials, equipment and parts. But you will find them compensating for that lack by an "all-out" offensive of helpfulness in the form of useful information in their advertisements and in the offer of booklets and other technical literature.

Advertising speeds vital information from those who have it . . . to those who need it.

★

panies whose products are being used for war or essential civilian purposes.

Neither the A-1-a nor the A-1-c rating may be used to replace material withdrawn from inventories, and the A-3 rating cannot be used for that purpose if, at current rates of consumption, further deliveries would increase inventories above the stipulated minimum. Prior authority, which may be obtained telegraphically, is required before application of the break-down ratings.

CONTRACTORS MAY BUY TIRES

Under the tire and tube rationing plans of January 5, trucks used by electrical contractors come within the scope of the "Eligibility Classification" established by WPB providing they are used exclusively for:

"Transportation of materials and equipment for the construction and maintenance of production facilities.

"Transportation of material and equipment for the construction of defense housing facilities and military and naval establishments.

"Transportation essential to render—electrical repair services."

WITH THE Manufacturers

M. H. Paine Retires

After 74 years of productive service, M. H. Paine, chairman of the board and plant superintendent of The Paine Company, retired from active participation in the business January 1.

Mr. Paine, who celebrated his 90th birthday last July, began his long business career in 1868. In 1887, he joined the Heywood Wakefield Company and 25 years later established The Paine Company.

Okonite Co. Additions

The Okonite Company, Passaic, N. J., has increased its sales force in the South.

Otis W. Herring and W. D. Stroud have joined the staff of the Birmingham office as sales engineers. Mr. Herring will be located in the Comer Building, Birmingham, Ala. and will handle Tennessee and the northern portion of Alabama and Mississippi. Mr. Stroud will be located at 621 Julia Street, New Orleans and will cover Louisiana and the Gulf Coast area of Florida, Alabama and Mississippi.

L. L'Heureux and W. H. Hammond have also joined the staff of the Atlanta Office. Mr. L'Heureux will handle the Florida territory from his home at 2360 St. Johns Ave., Jacksonville. Mr. Hammond will be located at 2538 Kenmore Avenue, Charlotte, N. C.

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★ **These companies have included Briefalogs, containing additional buying information on their products, in the 1942 edition of the Electrical Buyers' Reference.**

In the News

[FROM PAGE 129]

Allis-Chalmers Manufacturing Co., Milwaukee, has established a new department to coordinate the company's sales policies. Walter Geist vice-president, is to head this new department. He will also correlate the selling activities for all the company's products.

•

General Electric Co., Schenectady has appointed F. W. McChesney and Neal L. Parker assistant managers, sales of the industrial and of the machinery manufacturers section respectively.

•

Crocker-Wheeler Electric Manufacturing Company announces the appointment of Donald T. McDonald as manager of sales promotion and publicity. This newly created department has been established as the basis of a broad scale program of post-war planning.

•

Steber Manufacturing Co., Chicago have moved into new quarters at 2451-2457 N. Sacramento Ave. They were formerly located at 1020 W. Adams St.

•

Fullman Manufacturing Co., Latrobe, Pa. announces the appointment of A. H. Tutin, as sales representative in the New England territory. Mr. Tutin's headquarters are at 164 Oliver Street, Boston.

More Gossip

New Outlets Up

Electrical wiring was installed in 232 homes in the Greater Vancouver, B. C. area during October, bringing the total number of electrical installations this year to 2,205, and the total number of electrical outlets to 9,345 for the month, and 84,983 for the year to date. Through the efforts of the Electric Service League of British Columbia 348 outlets were added to homes visited by field men during October, and as a result the year's total of new added outlets has jumped to 2,644. A total of 2,217 calls were made by the field staff.

Of the new residences wired sixty had range wiring, thirty-three had Red Seal wiring except for ranges and fifty-nine were wired to Red Seal specifications.

Lighting Consultant

Karl Anton Piez, former lighting engineer for the Crooker Co., Providence, announced the formation of Lighting Equipmen, Inc., engineers, merchandisers and consultants.

The new company started operations Oct. 30, at 26 Custom House Street, Providence, R. I. It is engaging in the distribution of standard lighting fixtures, the design of special luminaires and the prepation of specifications and reports.

Back in Harness

Martin S. Willis, retired electrical contractor of Washington, D. C., is back in harness again, this time as an inspector. He recently accepted an appointment in the Electrical Inspections Office of that city.

Collins Serves on Navy Committee

J. Walter Collins, secretary of the Electrical Contractors' Association of the City of Chicago, has added a Navy Department appointment to his activities. He was recently made a member of the Vocational Advocate Committee of the Naval Aviation Department.

In this capacity, Walter will aid in placing skilled electricians, machinists or other specially trained or mechanically inclined men where their talents will be most useful in naval service. He is well qualified for this duty, since he has had an active hand in vocational guidance and apprenticeship training for many years.

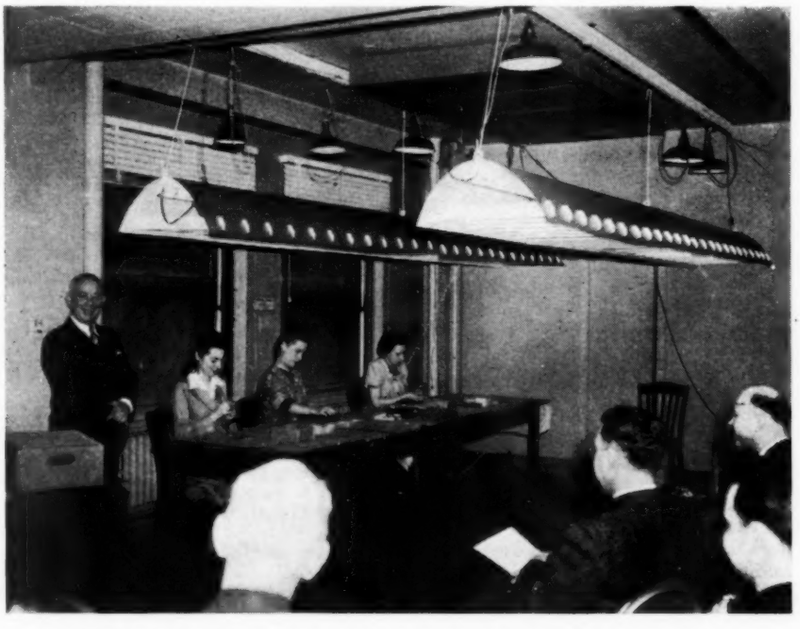
CULINARY ART is exhibited by Ed Wigdahl, president of Cook County Electrical Contractors Association, Chicago, as he cuts 4th Anniversary birthday cake. Elton Gould, (center) and Dave Talbot supervise the operations.

Wood Heads Fargo Exchange

Charles Wood, Central Electric Co., Fargo, N. D., former president of the North Dakota Electrical Contractors Association was elected president of the Fargo Builders and Traders Exchange for 1942.

Stephenson Called to Army

Charles Stephenson, of the North Central Associated Electrical Industries, in Minneapolis has been called into the Service as Second Lieutenant, Army Quartermaster Corps.



***WARTIME FIXTURES** for industrial applications during the emergency are introduced at the Chicago Lighting Institute. The outcome of the progressive thinking of E. D. Tillson and his staff at the Commonwealth Edison Co. Testing Laboratories in Chicago, the reflectors are made of pressed board commonly used in armature slots. Painted white on inside, the unit has a 77 per cent efficiency, is light in weight and the four 8-ft. sections shown will retail for about $80 including lamps. The units are purely experimental and were developed expressly for subcontracting plants where lighting is poor and priorities on metal fixtures are way down on the list.*

NO FLASH! NO FLICKER! NO ABUSE TO BALLAST!

THE HYGRADE PREMIUM MIRASTAT

Automatically Opens Circuit When Lamp Wears Out

The Last Word in Fluorescent Lamp Starters

You know what one continuously flickering lamp can do to the appearance and effectiveness of a whole fluorescent installation – how it can hamper production efficiency.

Well, Hygrade has solved that problem with the introduction of the new Premium Mirastat – the only standard starter designed to break the circuit automatically when the lamp's useful life is ended.

This exclusive Hygrade development results in a whole chain of improvements in lamp performance.

It stops the hour-after-hour flashing of dead lamps, for after a few short flashes, the Premium Mirastat cuts off the flow of current through the electrodes–protecting the ballast against overload and preventing current waste.

This makes it possible to postpone repairs until after working hours.

It makes group replacements practical.

And it lightens the burden on the starter itself, prolongs starter life.

Like all Hygrade starters, the Premium Mirastat provides positive starting and restarting through a unique timing device which insures proper preheating of cathodes. It is completely interchangeable with all standard starters – both as replacement and in new installations.

The few extra cents premium you pay for this standout performer means little compared to the extra service and protection the Premium Mirastat gives.

Write today for complete information to Dept. MEC3, Hygrade Sylvania Corporation, Salem, Mass.

All Mirastat Starters are approved by Underwriters' Laboratories, Inc.

When "blinkers" knock production flat, Change to Premium Mirastat!

"Everything that's Finest in Fluorescent"

HYGRADE SYLVANIA CORPORATION

SALEM, MASS.

Manufacturers of Hygrade Incandescent Lamps, Fluorescent Lamps, Fixtures, Starters, Sockets and Sylvania Radio Tubes

More Gossip

Jersey Leagues Help State Defense

The New Jersey Council of Electrical Leagues has offered the services of the Council as representatives of the electrical industry to the State Civil Defense Board in whatever capacity the organization might be able to serve. Dick Ruiter is chairman of this committee.

Green Bay's '42 Slate

The Electrical Contractors Association of Green Bay, Wisconsin recently installed new officers to guide the organization's activities during 1942. James C. Gerhard heads the list as president with Al DeGroot as vice-president. A. A. Allen was re-elected secretary-treasurer. The sergeant-at-arms is Leo DeGroot.

Governor Commends Rocky Mt. League

The Rocky Mountain Electrical League has again won signal honors. Supplementing national recognition, the League received a congratulatory letter from Governor Carr of Colorado commending them for stimulating holiday lighting throughout the Rocky Mountain area and giving civilian morale a boost when it was most needed. The governor now plans to light the state capitol building next year.

***CONSULTANT,** Ralph H. Decker, electrical engineer and estimator of Chicago, has taken on the task of showing members of the Cook County Electrical Contractors Association some of the fine points of estimating. Ralph enjoys his teaching role and is making real progress*

More Elbow Room

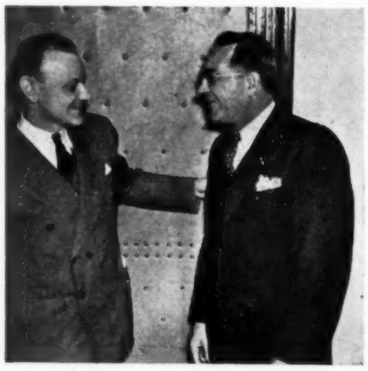
The Electric Maintenance Service Company, located in the vital war industry center of Bridgeport, Conn., is making good use of its enlarged motor repair shop facilities.

They are now occupying 30,000 sq. ft. of floor space, all on the ground floor, at 143 Bennet Street in Bridgeport. This represents more than three times the space they formerly occupied on three floors at 679 Warren Street. Now they are set to more efficiently service Bridgeport's vital industries.

Sihler Heads Rocky Mt. Contractors

A. A. Sihler, Denver, succeeds Ralph E. Johnson as chairman of the Electrical Contractors Division of the Rocky Mountain Electrical League.

All other chairmen of the various Divisions and Sections of the League during 1941 were reappointed to their respective chairs by President Alexander.



***A NEW IDEA** along the lines of cooperation bewteen lighting engineers and electrical contractors was recently launched by M. A. Havenhill (left), Kansas City Power and Light Co., and A. E. Smiley, Kansas City electrical contractor. They organized a lighting adequate wiring group within the local section IES, designed primarily to acquaint the contractor with the application, installation and efficient operation of fluorescent lighting.*

Inaugurate Industry Luncheons

The North Central Electrical Industries, Minneapolis, launched a series of Thursday noon luncheon meetings for members of the electrical trade in the Twin City area.

The meetings, the first of which was held January 15, are designed to help the industry operate with greater unity, and to provide a means of promoting good fellowship, exchange of mutual interests, and renewing and making friendships.

In general these get-togethers will be informal with prepared programs on special occasions. A regular feature will be short announcements regarding matters of general interest.

***INDUSTRY NEEDS** lighting vitamin "L" to increase production, Freeman Barnes, G.E. Lamp Department, pointed out to members of the Chicago Association of Commerce recently. Here, he illustrates what a three percent increase in production of six million defense workers can accomplish.*

Rocky Mountain League Activities

The 1942 slate of officers and executive committee on the Rocky Mountain Electrical League is as follows: president, J. W. Alexander; immediate past-president, G. B. Buck; vice-presidents, W. D. Johnston, T. M. Foulk, M. C. Heffelman, and Homer A. Fluckey; treasurer, W. C. Sterne.

The chairman of the various Divisions are: C. C. Baker, utilities; Thos. F. Savage, distributors; Harold L. Vaughan, manufacturers; A. A. Sihler, contractors; Herb Names, dealers and T. M. Foulk, joint sales and promotion section.

The League's activities for the coming year include the following program designed to fit the organization into the industry war program:

1. How to build up system load factors and level outpeak loads.
2. Study of lighting applications for defense, conservation of eyesight and increased productivity of vital materials.
3. Research and planning for the postwar period, to re-establish business on behalf of all branches of the industry.
4. Continuous cooperation with dealers to minimize loss of business and failures.
5. Creation of a farm service committee, working in conjunction with E.E.I., to stimulate methods and equipment which will give maximum increase in farm production.
6. A survey of electrical advertising in league territory, to determine how much of its energy might be devoted to defense measures in the event such an emergency arises.
7. Providing booklets and other information covering blackout methods and other pertinent defense measures.

SEE PAGE 129 FOR ADVERTISERS' INDEX

A LINE OF *Better* OIL-IMMERSED STARTERS

FOR HAZARDOUS AND CORROSIVE ATMOSPHERES

Easier to Install, Operate and Service

In chemical plants, oil refineries, powder and shell loading plants—wherever the presence of corrosive or explosive gases makes oil-immersed starters a necessity—this new Square D line is ready to do a job.

Easy Installation—Cast head with wiring manifold permits conduit entrance from five directions. Removable cover plate facilitates threading bare wire through insulating spacer above oil bath.

Easy to Service—Welded seam tank is designed for *minimum* quantity of oil. Tank has large, window-type oil-level gauge. Drain cock is recessed in bottom. Track-type guides prevent swinging and splashing or accidental collision with starter panel while tank is being raised or lowered. Hooks at bottom of guide track support tank in lowered position for inspection. Starter parts are readily accessible.

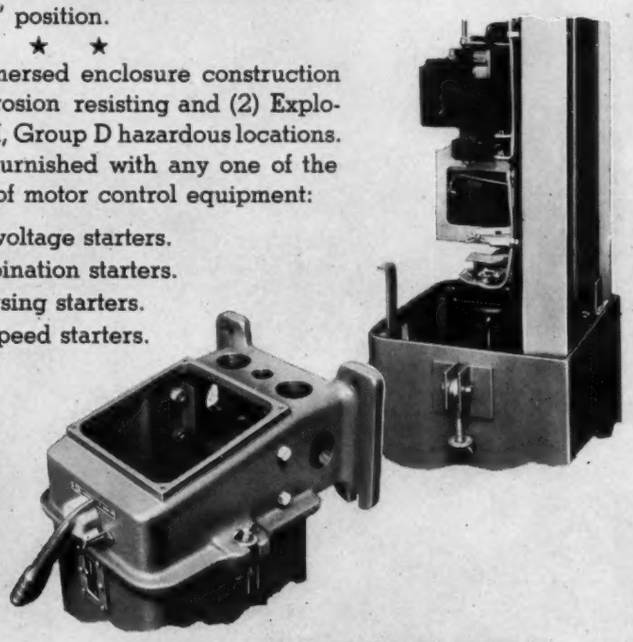
Efficient Operation—Magnetic overload relays are adjustable to suit conditions of application. Either hand or automatic reset relays are available. Removal of tank from a combination starter *automatically* throws breaker to "off" position.

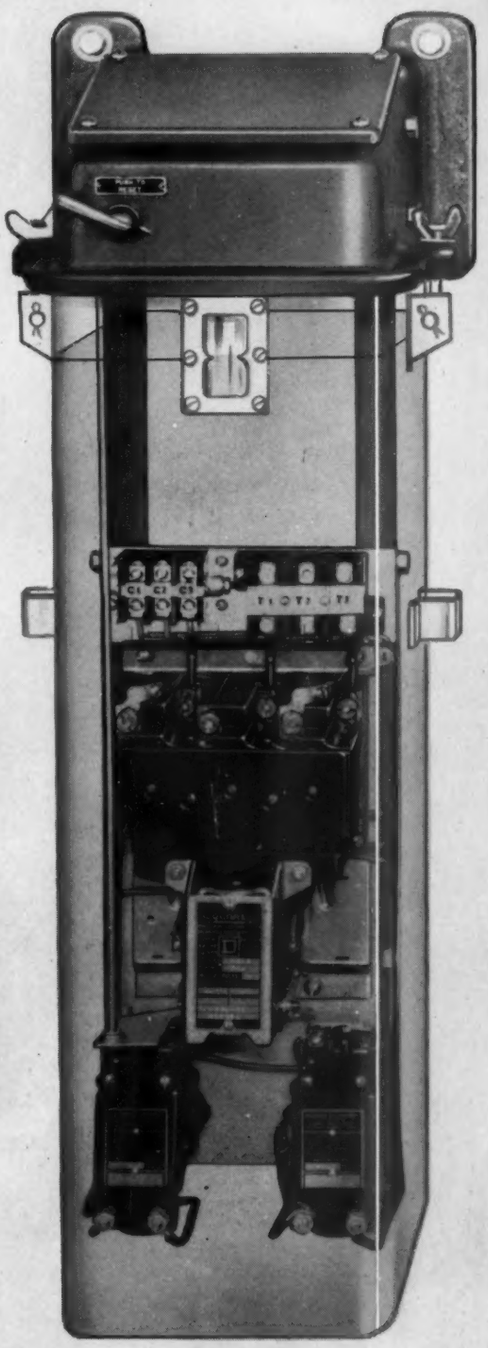
★ ★ ★

Two types of oil-immersed enclosure construction are available—(1) Corrosion resisting and (2) Explosion resisting for Class I, Group D hazardous locations.

Either type can be furnished with any one of the following four classes of motor control equipment:

1. Class 8537 line voltage starters.
2. Class 8539 combination starters.
3. Class 8737 reversing starters.
4. Class 8810 two speed starters.





SQUARE D COMPANY

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KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

CALL IN A SQUARE D MAN

G-E Wiring Materials Distributors All Over the Country

OFFER HELP ON WAR PROJECTS

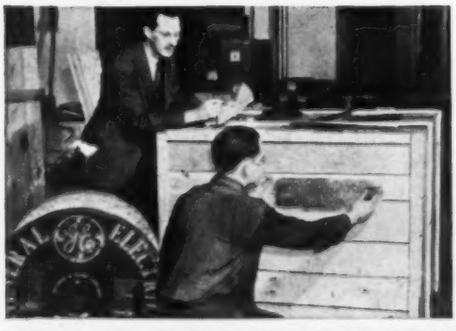
The G-E Wiring Materials Distributor in your territory is eager to co-operate with you in forwarding U.S. war efforts. His representatives can help with ideas and suggestions gained from long experience.

The variety and bigness of the line your G-E Wiring Materials Distributor handles assures suitable materials for war jobs. The line includes black and white conduit, boxes and fittings, wire and cable and wiring devices. These products are all high quality.

Good service and prompt delivery are aided by the size of this line and by your G-E Distributor's sincere desire to be helpful. Ask about materials to help speed war jobs you are handling, about war-time priority procedures, etc. Every assistance possible will be given.

Close co-operation was given by the General Electric Supply Corporation, Chicago, Illinois, when supplying wiring materials for a new plant constructed by an automotive manufacturer for war production. The electrical contractor was the Associated Electric Construction Company, composed of the Fries-Walters Co., the Kelso-Burnett Electric Co., the Harmon Electric Co. and the United Electrical Construction Co., all of Chicago. In the photograph Fred W. Schustedt, salesman, G-E Supply Corporation is discussing with contractors the floor outlets for the Fiberduct underfloor raceway system installed. Left to right: Mr. Schustedt; W. P. Pietsch, superintendent; J. R. Strom, engineer; H. L. Winograd, assistant purchasing agent; John F. Adamson, assistant works manager.

When R. A. Schaeffer (right) of the Schaeffer Electric Construction Co., Reading, Pa., needed surface wiring materials for speedy installation in temporary war-time buildings, he asked C. J. Clay, salesman for the Reading General Electric Supply Corporation house, for assistance. Mr. Clay helped him select suitable available materials.

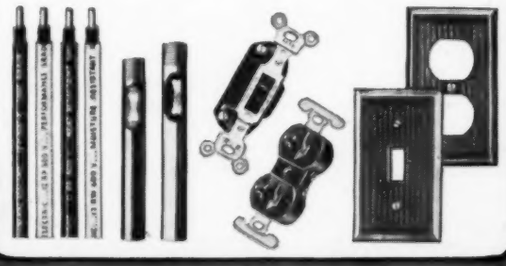


E. B. Latham and Co., New York, N. Y., has provided wiring materials for several U.S. naval and army bases in foreign locations. Here A. B. Steinheuser (left), manager of the foreign department is checking a shipment to the U.S. Naval Air Station, Trinidad, B.W.I. B. Lonczak, chief packer in foreign department is stencilling the address.

"Sell with a sample" is the plan used by Carl Rosser and Jerry Alexander, salesmen for Hendrie and Bolthoff Mfg. & Supply Co., Denver, Colorado. Samples of products are carried that will be particularly interesting to customers. Mr. Rosser helps his customers lay out lighting and wiring jobs of all sizes.

SEE YOUR G-E DISTRIBUTOR

The nearest G-E Wiring Materials Distributor will be glad to give you information about G-E conduits, wires and cables and wiring devices. He'll help you select materials particularly fitted to your war-time needs. General Electric Co., Appliance and Merchandise Dept., Bridgeport, Connecticut.



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